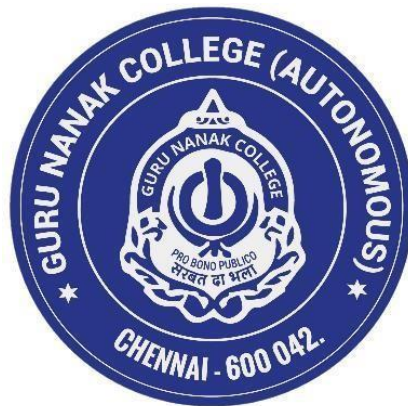


# **GURU NANAK COLLEGE (AUTONOMOUS)**

(Affiliated to University of Madras and Accredited at 'A++' Grade by NAAC)

Guru Nanak Salai, Velachery, Chennai - 600042



**SCHOOL OF INFORMATION TECHNOLOGY**

**B.Sc. DATA ANALYTICS**

**LEARNING OUTCOME BASED CURRICULUM FRAMEWORK**

(For the UG batch of 2024-27 and thereafter)

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# **LEARNING OUTCOME BASED CURRICULUM FRAMEWORK**

## **(For the UG batch of 2024-27 and thereafter)**

### **PREAMBLE**

This course presents an introduction in to the concepts of data analysis, the role of a Data Analyst, and the tools that are used to perform functions. One will gain an understanding of the data ecosystem and the fundamentals of data analysis, such as data gathering or data mining.

Data Analytics is the most demanded profession of the decade, and the demand for data scientists who can analyze data and communicate results to inform data-driven decisions has never been greater. This Professional program does not require any prior knowledge of computer science or programming languages required. This program is integrated with SAS India PVT Limited. SAS provides hands-on Training with the following modules

1. Programming for Analytics
2. Big Data Management and Visualization
3. Applied Statistical Modelling
4. Applied Machine Learning and Forecasting
5. Applied Text Analytics and Visualization Pitfalls

Also, the course will provide students with the latest job-ready tools and skills, including open source tools and libraries, Python, databases, SQL, data visualization, data analysis, statistical analysis, predictive modeling, and machine learning algorithms. One can learn data science through hands-on practice in the SAS Cloud using real data science tools and data sets. In addition, every student can earn digital badges and International Certifications from SAS recognizing your proficiency in data science.

This course will help the students to differentiate between the roles of a Data Analyst, Data Scientist, and Data Engineer. One can learn the responsibilities of a Data Analyst and exactly what data analysis entails. The course also helps the students to summarize the data ecosystem, such as databases and data warehouses. Big Data platforms such as Hadoop, Hive, and Spark are also covered in the Big Data Management. Students are also provided with a real time project.

## **Vision**

Train the students on technologies of Data Analytics to analyze data, create interactive dashboards, and publish insights of the data.

## **Mission**

- Strive for good graduate education that will prepare students for careers as competent professionals in industry and academia, capable of taking on new challenges in an ever-changing world.
- Students will understand the patterns and trends and find the significance in solving complex problems.
- Encourage the transmission of technologies to aid socio-economic growth.

## **PROGRAMME EDUCATIONAL OUTCOMES**

### **PEO 1: Values of Life, Ethics & Social Concern**

The graduates exhibit truth, loyalty, and love as integral moral principles, thereby contributing to a society characterized by enhanced well-being and fundamental goodness in behavior.

### **PEO 2: Employability & Entrepreneurship**

The graduates apply analytical, logical, and critical problem-solving skills in professional contexts, elevating employability and cultivating entrepreneurial capabilities through upskilling.

### **PEO 3: Regional/National/Global Relevance & Competency**

The graduates foster advanced analytical skills and a heightened appreciation for current Regional/National/Global perspectives, enabling informed and sustainable decision-making in a dynamic environment.

### **PEO 4: Skill Enhancement, Self-Directed & Lifelong Learning**

The graduates independently engage in skill-based learning, utilizing infrastructure and opportunities for continuous upskilling, enabling self-evaluation and lifelong excellence attainment.

### **PEO 5: Research Skills & Innovation**

The graduates proficiently apply scientific reasoning, fostering creativity, strategic thinking, and effective problem-solving skills. They demonstrate a core competency in generating innovative ideas for advancements and inventions.

## **PROGRAMME OUTCOMES**

- PO1:** Having the ability to develop software that aids society to minimize the effort.
- PO2:** Having the ability to employ techniques, skills, and modern hardware and software tools necessary to meet the current demand of the IT Industry.
- PO3:** Having Regional/National/Global Competency and being employable.
- PO4:** Have the ability to independently engage in Self-directed learning and an inclination to life-long learning and upskilling.
- PO5:** Demonstrate competency in generating innovative ideas for advancements and inventions.

## **PROGRAMME SPECIFIC OUTCOMES B.Sc. DATA ANALYTICS**

The following points are the expected outcomes of the three-year B.Sc. Data Analytics Programme of Guru Nanak College:

- PSO1:** Obtaining the ability to discuss and manifest proficiency with the concepts of key areas in Statistical Analysis which leads to the development of the project.
- PSO2:** Developing the knowledge to Construct and Analyze user needs with Data-Base Models.
- PSO3:** Inculcating the analytical skills to employ modern software tools like SAS is essential to fulfilling the present demands of the IT Sector.
- PSO4:** Proficiency in organizing, managing, and steering big data analytics in Global IT industries.
- PSO5:** Getting involved in National and International programmes to learn how to tackle issues in practical settings globally.

**PEO – PO mapping**

	<b>PEO 1</b>	<b>PEO2</b>	<b>PEO3</b>	<b>PEO4</b>	<b>PEO5</b>
<b>PO 1</b>	1	1	2	1	1
<b>PO 2</b>	1	2	1	1	1
<b>PO3</b>	1	1	1	2	1
<b>PO 4</b>	2	1	1	1	1
<b>PO 5</b>	1	2	1	1	2

**PO – PSO mapping**

	<b>PO 1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>
<b>PSO 1</b>	1	3	2	1	3
<b>PSO 2</b>	2	2	3	2	3
<b>PSO3</b>	3	1	3	3	2
<b>PSO 4</b>	2	2	2	3	1
<b>PSO 5</b>	3	1	1	2	2

## **CHOICE BASED CREDIT SYSTEM (CBCS)**

The College follows the CBCS with Grades under the Semester pattern. Each course is provided with a credit point based on the quantum of subject matter, complexity of the content and the hours of teaching allotted. This is done after a thorough analysis of the content of each subject paper by the members of the Board of Studies and with the approval of the Academic Council. Students are also offered a variety of Job oriented Elective, Multidisciplinary skill-based courses as part of the curriculum. Students can earn extra credits by opting for Massive Open Online Courses (MOOCs) and Certificate Courses.

The evaluation method under CBCS involves a more acceptable grading system that reflects the personality of the student. This is represented as Cumulative Grade Point Average (CGPA) and Grade Point Average (GPA) which are indicators of the Academic Performance of the student. It provides students with a scope for horizontal mobility and empowers them with the flexibility of learning at their convenience.

### **ELIGIBILITY FOR ADMISSION**

Candidates admitted to the first year of the UG programme should have passed the higher Secondary Examinations (Academic or Vocational Stream) conducted by the Government of Tamil Nadu or an examination accepted as equivalent thereof by the Syndicate of the University of Madras. Students applying for the PG programme should have taken the UG degree in the relevant subject from a recognized university as per the norms of the University of Madras.

For B.Com. (Hons): Candidates admitted to the first year of the B.Com. (Hons.) programme should have passed the higher secondary examinations conducted by the Government of Tamil Nadu or an examination accepted as equivalent thereof by the Syndicate of the University of Madras with 75 % cut-off in Commerce/Business studies, Accountancy, Economics and Business Mathematics/ Mathematics.

For MBA: The basic requirement for admission to the MBA programme is a Bachelor's degree in any discipline with a minimum of 50% marks in aggregate and satisfactory test score in MAT Entrance Test conducted by AIMA, New Delhi / TANCET for MBA conducted by Government of Tamil Nadu / CAT / XAT or any other approved MBA Entrance Tests.

For MCA: Only those candidates who have passed B.C.A/B.Sc. in Computer Science or any other equivalent degree OR passed B.Sc./B.Com/BA with Mathematics at 10 + 2 level or at graduation level (with Optional bridge course in Mathematics), provided they have undergone the course under 10+2+3 pattern and obtained at least 50% of marks (45 % marks in case of candidates belonging to reserved category) in the qualifying examination shall be eligible for admission to the M.C.A. Programme.

### **DURATION OF THE COURSE**

The UG programme is of three years duration with six semesters and the PG programme is of two years duration with four semesters. The period from June to November is termed as the odd semester and the period from December to April is referred to as the even semester. Each semester must compulsorily have 90 working days before the students appear for the final End Semester Exam.



## **COURSE OF STUDY**

The main course of study for the Bachelor's Degree shall consist of the following:

### **FOUNDATION COURSES**

PART - I: Tamil/ Hindi /Sanskrit/French

PART - II: English

### **CORE COURSES**

PART - III: Consisting of (a) Main subject (b) Allied Subjects (c) Elective subjects related to the main subject of study and project work.

PART – IV: Those who have not studied Tamil up to XII standard and have taken a non- Tamil language under Part – I, shall opt for Basic Tamil in the first two semesters.

Those who have studied Tamil up to XII standard, and taken a non -Tamil language under Part – I, shall opt for Advanced Tamil in the first two semesters.

Others, who do not come under either of the clauses mentioned above, can choose a Non-Major Elective (NME) in the first two semesters.

Soft Skills (I, II, III & IV Semesters)

Self-Study (Compulsory) Course (III Semester)

Environmental Studies (IV Semester)

Value Education (V Semester)

Summer Internship (After IV Semester)

PART - V: Compulsory Extension Services

A Student shall be awarded one credit for compulsory extension service. A student must enroll in NSS / NCC /Sports & Games/ Citizen Consumer Club / Enviro Club or any other service organization in the College and should put in compulsory minimum attendance of 40 hours, which shall be duly certified by the Principal of the College. If a student lacks 40 hours compulsory minimum attendance in the extension services in any Semester, s/he shall have to compensate the same, during the subsequent Semesters.

### **COURSE STRUCTURE**

The UG programme consists of 15-19 Core courses with 3-4 credits for each paper, 3 Elective courses and 4 Allied courses with 4-5 credits for each paper in addition to 4 Soft Skill courses with two credits each. Internship as a compulsory component carries 2 credits. The B.Com. (Hons) course has 31 core courses of 4 credits each and project with 8 credits.

The MBA programme has 15 core courses including project work with 4 credits, 6 elective courses with 3 credits, 2 extra disciplinary courses with 3 credits, Four Soft Skill courses with two credits each.

The MCA programme has 15 core courses of 2-4 credits, 5 Elective courses of 3 credits, 2 Extra-disciplinary courses of 3 credits and a project work of 17 credits.

Internship training is a compulsory component for all the UG & PG programmes.

**The details of the course structure are given in the following table:**

**B.Sc. Data Analytics**  
**Credit distribution for each semester**

<b>Semester I</b>		<b>Subject</b>	<b>Hrs./Week</b>	<b>Credit</b>	<b>Marks</b>		<b>Total</b>
<b>Course Component</b>					<b>Internals</b>	<b>Externals</b>	
					Part I	Language	
Part II	English	English – I	4	3	50	50	100
Part III	Core - I	Programming in JAVA	6	4	50	50	100
	Core-II	Practical-I: Programming for Analytics - I	4	4	50	50	100
	Allied-I	Mathematics for Analytics	6	5	50	50	100
Part IV	Non-Major Elective-I	Basic Tamil-I/ Advanced Tamil-I/ Multimedia Practical	2	2	50	50	100
	Soft Skills-I	Communication and Personality Development	2	2	50	50	100
<b>Total</b>			<b>30</b>	<b>23</b>			
<b>Semester II</b>		<b>Subject</b>	<b>Hrs./Week</b>	<b>Credit</b>	<b>Marks</b>		<b>Total</b>
<b>Course Component</b>					<b>Internals</b>	<b>Externals</b>	
					Part I	Language	
Part II	English	English – II	4	3	50	50	100
Part III	Core -III	Operating Systems and Linux	6	4	50	50	100
	Core-IV	Practical -II - Programming for Analytics - II	4	4	50	50	100
	Allied-II	Statistics – I	6	5	50	50	100
Part IV	Non Major Elective-II	Basic Tamil-II/ Advanced Tamil-II/ Practical - NME – E- Commerce Lab	2	2	50	50	100
	Soft Skills-II	Interview and Resume Writing	2	2	50	50	100
<b>Total</b>			<b>30</b>	<b>23</b>			

<b>Semester III</b>		<b>Subject</b>	<b>Hrs./Week</b>	<b>Credit</b>	<b>Marks</b>		<b>Total</b>
<b>Course Component</b>					<b>Internals</b>	<b>Externals</b>	
Part III	Core - V				Big Data Analytics	6	
	Core - VI	Database Management System	6	4	50	50	100
	Core - VII	R Programming	6	4	50	50	100
	Core - VIII	Practical - III – Big Data Management and Visualization	4	4	50	50	100
	Allied-III	Statistics – II	6	5	50	50	100
Part IV	Soft Skills-III	Adobe UX Foundation	2	2	50	50	100
	Self-Study (Compulsory) Course	Indian Heritage and Knowledge System/ Contemporary World and Sustainable Development	-	2	-	100	100
<b>Total</b>			<b>30</b>	<b>25</b>			
<b>Semester IV</b>		<b>Subject</b>	<b>Hrs./Week</b>	<b>Credit</b>	<b>Marks</b>		<b>Total</b>
<b>Course Component</b>					<b>Internals</b>	<b>Externals</b>	
Part III	Core - IX				Data Mining and Data Warehousing	5	
	Core - X	Advanced Python Programming	5	3	50	50	100
	Core - XI	Data Structures and Algorithm	6	4	50	50	100
	Core - XII	Practical - IV – Applied Statistical Modelling	4	4	50	50	100
	Allied - IV	Operations Research	6	5	50	50	100
Part IV	Soft Skills-IV	Foundations of Quantitative Aptitude	2	2	50	50	100
	EVS	Environmental Studies	2	2	50	50	100
<b>Total</b>			<b>30</b>	<b>24</b>			

<b>Semester V</b>		<b>Subject</b>	<b>Hrs./Week</b>	<b>Credit</b>	<b>Marks</b>		<b>Total</b>
<b>Course Component</b>					<b>Internals</b>	<b>Externals</b>	
Part III	Core - XIII	Machine Learning	6	4	50	50	100
	Core - XIV	Software Engineering	6	4	50	50	100
	Core - XV	Practical - V – Applied Machine Learning and Forecasting	6	4	50	50	100
	Elective – I	Cyber Security	6	5	50	50	100
	Elective – II	Cloud Computing	5	5	50	50	100
Part IV	Value Education	Value Education	1	2	50	50	100
Part V	Internship	Internship	-	2	-	-	-
<b>Total</b>			<b>30</b>	<b>26</b>			
<b>Semester VI</b>		<b>Subject</b>	<b>Hrs./Week</b>	<b>Credit</b>	<b>Marks</b>		<b>Total</b>
<b>Course Component</b>					<b>Internals</b>	<b>Externals</b>	
Part III	Core - XVI	Web Design and Development	6	4	50	50	100
	Core - XVII	Artificial Intelligence	6	4	50	50	100
	Core - XVIII	Practical - VI – Applied Text Analytics and Visualization Pitfalls	6	4	50	50	100
	Core - XIX	Mini Project	6	3	50	50	100
	Elective - III	Blockchain Technologies	6	5	50	50	100
Part V	Extension Activity	Participation in NSS/NCC/ROTRAC T etc.	-	1	-	-	-
<b>Total</b>			<b>30</b>	<b>21</b>			
<b>Total Credits</b>			<b>142</b>				

### Total credit distribution for all the 3 years

		No. of Paper	Credits
Part I	Language	2	6
Part II	English	2	6
Part III	Core	19	74
	Allied	4	20
	Elective	3	15
Part IV	NME	2	4
	Soft Skills	4	8
	Self-Study (Compulsory) Course	1	2
	EVS	1	2
	Value Education	1	2
	Internship	1	2
Part V	Extension activity	1	1
<b>Total</b>			<b>142</b>

### EXAMINATION

Continuous Internal Assessment (CIA) will be for 50 percent and End Semester Examination (ESE) will be for 50 percent.

#### CONTINUOUS INTERNAL ASSESSMENT (CIA)

Every semester will have a mid-semester examination which will be conducted on completion of 45 working days in each semester. A Model exam for three hours duration will be conducted on completion of 80 working days in each semester. For the courses coming under Part IV, ESE will be conducted in MCQ pattern. Internship credits will be given in semester V after verification of documents by the respective Heads.

The schedule for these tests is as follows:

CIA	Schedule	Syllabus Coverage
Mid Semester Examination	After <b>45</b> working days of the Semester	60%
Model Examination	After <b>80</b> working days of the Semester	95%

The components for the CIA (Theory & Practicals) are as follows:

<b>Internal Components</b>			
<b>Assessment Type</b>	<b>Nature</b>	<b>Maximum Marks</b>	<b>% of Weightage</b>
CIA	Mid Semester Examination	50	10
Model	Model Examination	100	10
	Assignment		10
	Class activities		15
	Attendance		5
<b>Total</b>			<b>50</b>

The class activity relates to a programme of accepted innovative techniques such as Seminar, Quiz, Portfolio creation, PowerPoint presentation, Objective tests, Role play, Group discussion, Case Study etc. The mode of evaluation of the class activity will be fixed before the commencement of the semester and an approval will be obtained from the Head of the programme/wing. The students will be informed of the various methods of evaluation once the semester begins.

A record of all such assessment procedures will be maintained by the department and is open for clarification. Students will have the right to appeal to the Principal in case of glaring disparities in marking. CIA marks for practical subjects will be awarded by the respective faculty based on the performance of the student in the model practical examination, observation notebook, submission of record books, regularity and attendance for the practical classes. The attendance particulars for practical classes will be maintained by the concerned faculty. The marks for attendance will be awarded as per the following:

<b>% of General Attendance</b>	<b>Marks Awarded</b>
90-100	5
75-89	4
60-74	3
<60	0

### **END SEMESTER EXAMINATIONS (ESE)**

After the completion of a minimum of 90 working days each semester, the End Semester Examinations will be conducted. Examinations for all UG and PG programmes will be held for all courses in November/December and April/May. Practical examinations will be conducted only during the end of the odd / even semester before, during or after the commencement of the theory exam. The schedule for ESE Practicals will be notified by the Controller of Examinations in consultation with the Dean (Academics)

## Mode of Evaluation

METHODS OF EVALUATION		
Internal Evaluation	Mid Sem Exam (10)	50 Marks
	Model Exam (10)	
	Assignment (10)	
	Class activity (15)	
	Attendance (5)	
External Evaluation	End Semester Examination	50 Marks
<b>Total</b>		<b>100 Marks</b>

## Method of assessment

<b>Remembering (K1)</b>	<ul style="list-style-type: none"> <li>The lowest level of questions requires students to recall information from the course content</li> <li>Knowledge questions usually require students to identify information in the textbook.</li> <li>Suggested Keywords: <b>Choose , Define, Find, How, Label, List, Match, Name, Omit, Recall, Relate, Select, Show, Spell, Tell, What, When, Where, Which, Who, Why</b></li> </ul>
<b>Understanding (K2)</b>	<ul style="list-style-type: none"> <li>Understanding off acts and ideas by comprehending organizing, comparing, translating, interpolating and interpreting in their own words.</li> <li>The questions go beyond simple recall and require students to combined at altogether</li> <li>Suggested Keywords: <b>Classify, Compare, Contrast, Demonstrate, Explain, Extend, Illustrate, Infer, Interpret, Outline, Relate, Rephrase, Show, Summarize, Translate</b></li> </ul>
<b>Application (K3)</b>	<ul style="list-style-type: none"> <li>Students have to solve problems by using / applying a concept learned in the classroom.</li> <li>Students must use their knowledge to determine a exact response.</li> <li>Suggested Keywords: <b>Apply, Build, Choose, Construct, Develop, Experiment with, Identify, Interview, Make use of, Model, Organize, Plan, Select, Solve, Utilize</b></li> </ul>
<b>Analyze (K4)</b>	<ul style="list-style-type: none"> <li>Analyzing the question is one that asks the students to breakdown something into its component parts.</li> <li>Analyzing requires students to identify reasons causes or motives and reach conclusions or generalizations.</li> <li>Suggested Keywords: <b>Analyze, Assume, Categorize, Classify, Compare, Conclusion, Contrast, Discover, Dissect, Distinguish, Divide, Examine, Function, Inference, Inspect, List, Motive, Relationships, Simplify, Survey, Take part in, Test for, Theme</b></li> </ul>

<b>Evaluate (K5)</b>	<ul style="list-style-type: none"> <li>• Evaluation requires an individual to make judgment on something.</li> <li>• Questions to be asked to judge the value of an idea, a character , a work of art, or a solution to a problem.</li> <li>• Students are engaged in decision-making and problem–solving.</li> <li>• Evaluation questions do not have single right answers.</li> <li>• Suggested Keywords: <b>Agree, Appraise, Assess, Award, Choose, compare, Conclude, Criteria, Criticize, Decide, Deduct, Defend, Determine, Disprove, Estimate, Evaluate, Explain, Importance, Influence, Interpret, Judge, Justify, Mark, Measure, Opinion, Perceive, Prioritize, Prove, Rate, Recommend, Rule on, Select, Support, Value</b></li> </ul>
<b>Create (K6)</b>	<ul style="list-style-type: none"> <li>• The questions of this category challenge students to get engaged in creative and original thinking.</li> <li>• Developing original ideas and problem solving skills</li> <li>• Suggested Keywords: <b>Adapt, Build, Change, Choose, Combine, Compile, Compose, Construct, Create, Delete, Design, Develop, Discuss, Elaborate, Estimate, Formulate, Happen, Imagine, Improve, Invent, Make up, Maximize, Minimize, Modify, Original, Originate, Plan, Predict, Propose, Solution, Solve, Suppose, Test, Theory</b></li> </ul>



# **SEMESTER – I**

<b>PROGRAMME: B.Sc., DATA ANALYTICS</b>	<b>BATCH: 2024 -2027</b>
<b>PART: III</b>	<b>COURSE COMPONENT: CORE – I</b>
<b>COURSE NAME: PROGRAMMING IN JAVA</b>	<b>COURSE CODE:</b>
<b>SEMESTER: I</b>	<b>MARKS:100</b>
<b>CREDITS: 4</b>	<b>TOTAL HOURS:90</b>
<b>THEORY</b>	

**COURSE OBJECTIVE:**

To understand the importance of object-oriented concepts and to provide the knowledge of Applet programming

**COURSE OUTCOMES:**

1. Understand the Object-Oriented Techniques
2. Apply branching and looping statement in Java programs
3. Understand the concepts of String Buffer Class
4. Create user defined package
5. Develop applet programming to draw simple shapes

**UNIT 1**

**(18 HOURS)**

Introduction to Java – **Object** Oriented Concepts – Java Tokens - Java Statements – Constants – Variables - Data Types - Type Casting – Operators – Expressions.

**UNIT II**

**(18 HOURS)**

Control Statements: Branching and Looping Statements. Classes – Objects – Methods - Constructors – Overloading methods – Inheritance – Overriding methods.

**UNIT III**

**(18 HOURS)**

Finalizer and Abstract Methods - Visibility Control – Arrays – String Class — String Arrays – String Methods - String Buffer Class. Interfaces: Defining Interfaces - Extending Interfaces - Implementing Interfaces-Accessing Interfaces.

**UNIT IV**

**(18 HOURS)**

Packages: Creating Packages - Accessing Packages – Importing Packages. Thread: Creating Threads - Stopping and Blocking a Thread - Life Cycle of a Thread - Using Thread Methods - Thread Priority.

**UNIT V**

**(18 HOURS)**

Exception Handling: try, catch, throw and throws. Applet Programming: Applet Life Cycle, Graphics Programming: Drawing Lines, Drawing Rectangles, Drawing Ellipses and Circles.

**PRESCRIBED BOOKS:**

1. P. Naughton and H.Schildt - Java 2(The Complete Reference) – 2018, 10th EditionTMH
2. Programming with Java, - A Primer – E. Balaguruswamy, 5 thEdition.

## REFERENCE BOOKS:

1. Ken Arnold, The Java Programming Language-Third Edition, Addison WesleyLongman , 2000
2. Ivan Bayross, HTML Javascript, DHTML, and PHP, First Edition- 2015, Fourth Revised Edition: 2010
3. Sachin.B.Patil, FAQ's in Java, Mr.Purushothaman, 2011 Scitech Publications(India) Pvt .ltd
4. Programming in Java –C.Muthu

## E-LEARNING RESOURCES:

1. <https://www.javatpoint.com/java-tutorial>.
2. <https://beginnersbook.com/java-tutorial-for-beginners-with-examples/>
3. <https://www.tutorialspoint.com/java/index.htm>
4. <https://www.w3school.com>
5. <https://www.greeksforgreeks.com>

## GUIDELINES TO THE QUESTION PAPER SETTERS QUESTION

### PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions(each in 50 words)	1-12	3	30
B	Answer any 5 out of 7 questions(each in 300 words)	13-19	6	30
C	Answer any 4 out of 6 questions(each in 1200 words)	20-25	10	40
<b>TOTAL MARKS</b>				<b>100</b>

### BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	2	2	1
II	2	2	1
III	3	1	2
IV	3	1	1
V	2	1	1
<b>TOTAL</b>	12	7	6
<b>SECTION A – 12</b>		<b>SECTION B – 7</b>	<b>SECTION C - 6</b>

### PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	3	2	3	3
CO 2	3	2	3	2	2
CO 3	3	3	3	3	3
CO 4	2	3	3	3	3
CO 5	3	3	2	3	3
Avg.	2.8	2.8	2.6	2.8	2.8

### PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Understand Problem Solving techniques and Object Oriented Techniques	PSO1, PSO2, PSO3, PSO4, PSO5	K1
CO2	Apply branching and looping statement in Java programs	PSO1, PSO2, PSO3, PSO4, PSO5	K2
CO3	Understand the concepts of String Buffer Class	PSO1, PSO2, PSO3, PSO4, PSO5	K3
CO4	Create user defined package	PSO1, PSO2, PSO3, PSO4, PSO5	K4
CO5	Develop applet programming to draw simple shapes	PSO1, PSO2, PSO3, PSO4, PSO5	K5, K6

**K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create**

<b>PROGRAMME: B.Sc., DATA ANALYTICS</b>	<b>BATCH: 2024 -2027</b>
<b>PART: III</b>	<b>COURSE COMPONENT: CORE – II</b>
<b>COURSE NAME: PRACTICAL-I: PROGRAMMING FOR ANALYTICS – I</b>	<b>COURSE CODE:</b>
<b>SEMESTER: I</b>	<b>MARKS:100</b>
<b>CREDITS: 4</b>	<b>TOTAL HOURS:60</b>
<b>PRACTICAL</b>	

**COURSE OBJECTIVE:**

To understand how to write SAS programs to access, explore, prepare, and analyze data.

**COURSE OUTCOME:**

1. Demonstrate Access SAS, Microsoft Excel
2. Explore and validate data
3. Analyze and report on data
4. Understand and create custom formats
5. Implement restructure tables

**Exercises:**

- Access SAS, Microsoft Excel, and text data.
- Explore and validate data.
- Prepare data by sub-setting rows and computing new columns.
- Analyze and report on data.
- Create an accumulating column and process data in groups.
- Manipulate data with functions.
- Convert column type.
- Create custom formats.
- Concatenate and merge tables.
- Process repetitive code.
- Restructure tables.

**Required Texts**

- 1.SAS Programming Essentials, SAS Institute, Cary.
- 2.SAS Data Manipulation Techniques, SAS Institute, Cary.

**Reference Texts**

- 1.Step-by-Step Programming with Base SAS, SAS Institute, Cary.
- 2.The Little SAS Book: A Primer, Sixth Edition, SAS Institute, Cary.

**SAS Internal Reference**

LAB1; C1 – PG1V2, C2 – PG2V2; Exam Weightage – 50:50.

**PSO – CO mapping**

	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO 1</b>	3	3	3	3	3
<b>CO 2</b>	3	2	3	2	2
<b>CO 3</b>	3	3	3	3	3
<b>CO 4</b>	2	3	3	3	3
<b>CO 5</b>	3	3	2	3	3
<b>Avg.</b>	2.8	2.8	2.8	2.8	2.8

**PSO-CO-question paper mapping**

<b>CO No:</b>	<b>COURSE OUTCOME</b>	<b>PSOs ADDRESSED</b>	<b>COGNITIVE LEVEL (K1 to K6)</b>
CO1	Demonstrate Access SAS, Microsoft Excel	PSO1, PSO2, PSO3, PSO4, PSO5	K1, K2, K3, K4, K5
CO2	Explore and validate data	PSO1, PSO2, PSO3, PSO4, PSO5	K1, K2, K3, K4, K5
CO3	Analyze and report on data	PSO1, PSO2, PSO3, PSO4, PSO5	K1, K2, K3, K4, K5
CO4	Understand and create custom formats	PSO1, PSO2, PSO3, PSO4, PSO5	K1, K2, K3, K4, K5, K6
CO5	Implement restructure tables	PSO1, PSO2, PSO3, PSO4, PSO5	K1, K2, K3, K4, K5

**K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create**

<b>PROGRAMME: B.Sc., DATA ANALYTICS</b>	<b>BATCH: 2024 - 25</b>
<b>PART: III</b>	<b>COURSE COMPONENT: ALLIED - I</b>
<b>COURSE NAME: MATHEMATICS FOR ANALYTICS</b>	<b>COURSE CODE:</b>
<b>SEMESTER: I</b>	<b>MARKS:100</b>
<b>CREDITS: 5</b>	<b>TOTAL HOURS: 90</b>
<b>THEORY AND PROBLEMS</b>	

**COURSE OBJECTIVE:**

On completion of the course the students will be able to understand and apply the principles of mathematics

**COURSE OUTCOMES:**

1. Recall the basic concepts of matrices, determinants set theory, co ordinate geometry and differentiation
2. Understand the types of Matrices, solving determinants, basic differentiation.
3. Apply operations of matrix to find eigen value, inverse formula, subsets straight lines and first order derivatives
4. Analyze the transpose of matrix, minors of determinants, finite and infinite sets, parallel lines and second order derivatives
5. Evaluate eigen vectors, inverse of a matrix, cartesian product, perpendicular distance from (x, y) on the line  $ax+by+c = 0$ , maximum and minimum of a functions.

**UNIT I**

**(18 Hours)**

**Matrices:** Kind of matrices, Symmetric matrix, Skew symmetric matrix, Hermitian matrix, Skew Hermitian matrix, Orthogonal matrix, Unitary matrix, Rank of the matrix, Transpose echelon form, Homogeneous equations, Eigen value and Eigen vectors  
Chapter 14

**UNIT II**

**(18 Hours)**

**Determinants:** Introduction, determinant of matrix of order  $2 \times 2$  and  $3 \times 3$ , minors and cofactors, inverse of a matrix, applications of matrix and determinants.  
Chapter 14

**UNIT III**

**(18 Hours)**

**Set Theory:** Finite and infinite sets, Examples of finite sets, example of infinite sets, description of sets, the tabulation method, set builder method, Null set, Sub-set, notation, equality of sets, number of subsets of a set, disjoint sets, universal sets, set operations, union of sets, intersection of sets, difference of sets, complement of sets, Venn diagram, law of sets De Morgan laws, number of elements in a set, cartesian product.  
Chapter 1

**UNIT IV**

**(18 Hours)**

**Co-ordinate Geometry:** Distance between two points, the co-ordinates of the points which divide the line joining two points internally and externally in a given ratio, straight line, conditions for parallel and perpendicular lines, perpendicular distance from (x,y) on the line  $ax+by+c=0$ .  
Chapter 12

**UNIT V**

**(18 Hours)**

**Differentiation:** First order and second order differentiation, maxima and minima of two variables.  
Chapter 13

**PRESCRIBED BOOK:**

Business Mathematics - P.R.Vittal.

**REFERENCE BOOKS:**

Allied mathematics – P. Durai pandian, Dr.S.Udayabaskaran , S.Chand and company limited, Reprint 2018.

**E-LEARNING RESOURCES:**

1. <https://nptel.ac.in/courses/111108157>
2. <https://nptel.ac.in/courses/111104416>
3. <https://openlearninglibrary.mit.edu/courses/course-v1:MITx+18.01.1x+2T2019/about>

**GUIDELINES TO THE QUESTION PAPER SETTERS****QUESTION PAPER PATTERN**

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions (each in 50 words)	1 - 12	3	30
B	Answer any 5 out of 7 questions (each in 300 words)	13 - 19	6	30
C	Answer any 4 out of 6 questions (each in 1200 words)	20 - 25	10	40
<b>TOTAL MARKS</b>				<b>100</b>

**BREAK UP OF QUESTIONS FOR THEORY**

UNITS	SECTION A		SECTION B		SECTION C	
	THEORY	PROBLEM	THEORY	PROBLEM	THEORY	PROBLEM
I	1	1	-	1	-	1
II	1	1	-	1	-	1
III	1	1	-	1	-	1
IV	1	1	-	1	-	1
V	1	1	-	1	-	1
Any Unit	-	2		2	-	1
TOTAL	5	7		7	-	6
	SECTION A - 12		SECTION B - 7		SECTION C - 6	



### PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	2	3	2
CO 2	3	2	3	2	3
CO 3	2	3	2	3	2
CO 4	3	3	2	2	3
CO 5	2	2	3	3	2
Ave.	2.4	2.6	2.4	2.6	2.4

### PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSE D	COGNITIVE LEVEL (K1 to K6)
CO1	Recall the basic concepts of matrices, determinants set theory, coordinate geometry and differentiation	1-5	K1
CO2	Understand the types of Matrices, solving determinants, basic differentiation.	1-5	K1,K2
CO3	Apply operations of matrix to find eigen value, inverse formula, subsets straight lines and first order derivatives	1-5	K3
CO4	Analyse the transpose of matrix, minors of determinants, finite and infinite sets, parallel lines and second order derivatives	1-5	K3,K4
CO5	Evaluate eigen vectors, inverse of a matrix, cartesian product, perpendicular distance from (x,y) on the line $ax+by+c=0$ , maximum and minimum of a functions.	1-5	K5

**K1=Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create**

<b>PROGRAMME: B.Sc., DATA ANALYTICS</b>	<b>BATCH: 2024 -2027</b>
<b>PART: IV</b>	<b>COURSE COMPONENT: NON-MAJOR ELECTIVE-I</b>
<b>COURSE NAME: MULTIMEDIA PRACTICAL</b>	<b>COURSE CODE:</b>
<b>SEMESTER: I</b>	<b>MARKS:100</b>
<b>CREDITS: 2</b>	<b>TOTAL HOURS:30</b>
<b>PRACTICAL</b>	

**COURSE OBJECTIVE:**

To understand the Concept, development and implementation of new multimedia systems and applications based in emergent technologies.

**COURSE OUTCOME:**

1. Demonstrate selection tools
2. Apply separation of background object and combining images
3. Implementation of Transform tools
4. Apply to handle different filters
5. Implementation of design visiting card

**GIMP**

1. Implementation of different Selection Tool.
2. Applying different View Options.
3. Implementation of Transforming and sizing.
4. Images-adding, Deleting and Moving.
5. Layers-Implementation of Paint Tool.
6. Implementation of Transform Tool.
7. Implementation of different Filters.
8. Implementation of different Color Tools

**PSO – CO mapping**

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
<b>CO 1</b>	3	3	3	3	3
<b>CO 2</b>	3	2	2	2	2
<b>CO 3</b>	3	3	2	3	3
<b>CO 4</b>	2	3	2	2	3
<b>CO 5</b>	3	3	2	3	2
<b>Avg.</b>	2.8	2.8	2.2	2.6	2.6

**PSO-CO-question paper mapping**

<b>CO No:</b>	<b>COURSE OUTCOME</b>	<b>PSOs ADDRESSED</b>	<b>COGNITIVE LEVEL (K1 to K6)</b>
CO1	Demonstrate selection tools	PSO1,PSO2,PSO3, PSO4,PSO5	K1,K2
CO2	Apply separation of background object and combining images	PSO1,PSO2,PSO3, PSO4,PSO5	K2
CO3	Implementation of Transform tools	PSO1,PSO2,PSO3, PSO4,PSO5	K3
CO4	Apply to handle different filters	PSO1,PSO2,PSO3, PSO4,PSO5	K4
CO5	Implementation of design visiting card	PSO1,PSO2,PSO3, PSO4,PSO5	K5, K6

**K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create**

## **SEMESTER - II**

<b>PROGRAMME: B.Sc., DATA ANALYTICS</b>	<b>BATCH: 2024 -2027</b>
<b>PART: III</b>	<b>COURSE COMPONENT: CORE – III</b>
<b>COURSE NAME: OPERATING SYSTEMS AND LINUX</b>	<b>COURSE CODE:</b>
<b>SEMESTER: II</b>	<b>MARKS:100</b>
<b>CREDITS: 4</b>	<b>TOTAL HOURS:90</b>
<b>THEORY</b>	

**COURSE OBJECTIVE:**

To develop expertise in operating system concepts and work with Shell programming.

**COURSE OUTCOMES:**

1. Build the basics knowledge of operating system concepts
2. Study the types of scheduling algorithms
3. Understand various memory management techniques
4. Apply basic Unix commands and File system commands
5. Develop Shell programs using branching control structure

**UNIT 1**

**(18 HOURS)**

Introduction: What is an Operating System? – Operating System Structure: Components – Services. Process Management: Process – The Process – Process State – Process Control Block – Threads - Process Scheduling: Scheduling Queues – Schedulers – Context Switch - Cooperating Process.

**UNIT II**

**(18 HOURS)**

CPU Scheduling: CPU – I/O Burst Cycle - CPU Schedulers – Preemptive Scheduling - Dispatcher – Scheduling criteria – Scheduling Algorithms: First-Come, First-Served Scheduling – Shortest Job-First Scheduling – Priority Scheduling – Round-Robin Scheduling – Multilevel Queue Scheduling - Deadlock: Characterization – Methods for handling Deadlocks – Prevention, Avoidance and Detection of Deadlock - Recovery from deadlock.

**UNIT III**

**(18 HOURS)**

Memory Management Strategies: Background – Swapping (Standard Swapping alone) - Contiguous Memory Allocation – Segmentation (Basic Method alone) – Paging (Basic Method alone).

**UNIT IV**

**(18 HOURS)**

Introduction to Unix – Unix Components – Commands in Unix – Command Substitution – File and File Organization: Unix files – categories of files- file system – directory commands File related commands. File Attributes and Permission – Standard I/O- Redirection, pipes and filters.

**UNIT V**

**(18 HOURS)**

Shell Programming: Shell variables – positional parameters – branching control structures – loop control structures - Regular Expressions –The Grep family – The process- Parent and child process- types of process – foreground and background process.

**PRESCRIBED BOOKS:**

1. Abraham Silberschatz Peter B. Galvin, G. Gagne, “Operating System Concepts”, Ninth Edition, International Student Version. John Wiley & Sons (Asia) Pvt. Ltd, 2014.
2. M.G. Venkateshmurthy, ”Introduction to Unix and shell programming “, Pearson Education India, New Delhi, 2009.

**REFERENCE BOOKS:**

1. Operating systems - Internals and Design Principles, W. Stallings, 6th Edition.

**E-LEARNING RESOURCES:**

1. <http://www.ics.uci.edu/~ics143/lectures.html>
2. <http://williamstallings.com/Extras/OS-Notes/notes.html>

**GUIDELINES TO THE QUESTION PAPER SETTERS QUESTION PAPER PATTERN**

SECTION	QUESTION COMPONENT	NUMBER S	MARKS	TOTAL
<b>A</b>	<i>Answer any 10 out of 12 questions(each in 50 words)</i>	1-12	3	30
<b>B</b>	<i>Answer any 5 out of 7 questions(each in 300 words)</i>	13-19	6	30
<b>C</b>	<i>Answer any 4 out of 6 questions(each in 1200 words)</i>	20-25	10	40
<b>TOTAL MARKS</b>				<b>100</b>

**BREAK UP OF QUESTIONS**

UNITS	SECTION A	SECTION B	SECTION C
I	2	2	1
II	2	2	1
III	3	1	2
IV	3	1	1
V	2	1	1
<b>TOTAL</b>	12	7	6
<b>SECTION A – 12</b>		<b>SECTION B – 7</b>	<b>SECTION C - 6</b>

**PSO – CO mapping**

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
<b>CO 1</b>	3	3	2	3	3
<b>CO 2</b>	3	3	3	2	2
<b>CO 3</b>	3	2	3	3	3
<b>CO 4</b>	2	3	3	3	3
<b>CO 5</b>	3	3	3	2	3
<b>Avg.</b>	2.8	2.8	2.8	2.6	2.8

**PSO-CO-question paper mapping**

<b>CO No:</b>	<b>COURSE OUTCOME</b>	<b>PSOs ADDRESSED</b>	<b>COGNITIVE LEVEL (K1 to K6)</b>
CO1	Build the basics knowledge of operating system concepts	PSO1, PSO2, PSO3, PSO4, PSO5	K1
CO2	Study the types of scheduling algorithms	PSO1, PSO2, PSO3, PSO4, PSO5	K2
CO3	Understand various memory management techniques	PSO1, PSO2, PSO3, PSO4, PSO5	K3
CO4	Apply basic Unix commands and File system commands	PSO1, PSO2, PSO3, PSO4, PSO5	K4
CO5	Develop Shell programs using branching control structure	PSO1, PSO2, PSO3, PSO4, PSO5	K5, K6

**K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create**

<b>PROGRAMME: B.Sc., DATA ANALYTICS</b>	<b>BATCH: 2024 -2027</b>
<b>PART: III</b>	<b>COURSE COMPONENT: CORE – IV</b>
<b>COURSE NAME: PRACTICAL-II: PROGRAMMING FOR ANALYTICS – II</b>	<b>COURSE CODE:</b>
<b>SEMESTER: II</b>	<b>MARKS:100</b>
<b>CREDITS: 4</b>	<b>TOTAL HOURS:60</b>
<b>PRACTICAL</b>	

### **COURSE OBJECTIVE:**

To understand the SAS macro facility to design, write, and debug macro programs, with an emphasis on understanding how programs that contain macro code are processed.

### **COURSE OUTCOME:**

1. Understand and perform text substitution in SAS code
2. Identify and use macro variables and macro functions
3. Write self-modifying and data-driven programs
4. Create data-driven macro variables using query
5. Implement DBMS data with SAS/Access technology

### **EXERCISES:**

- Perform text substitution in SAS code.
- Use macro variables and macro functions.
- Automate and customize the production of SAS code.
- Conditionally or iteratively construct SAS code.
- Write self-modifying, data-driven programs.
- Query and subset data.
- Summarize and present data.
- Combine tables using joins and set operators.
- Create and modify tables and views.
- Create data-driven macro variables using a query.
- Access DBMS data with SAS/ACCESS technology.

### **Course Materials Required Texts**

1. SAS Macro Language Essentials, SAS Institute, Cary.
2. SAS SQL Essentials, SAS Institute, Cary.

### **REFERENCE TEXTS**

1. SAS Macro Programming Made Easy, Third Edition, SAS Institute, Cary.
2. Carpenter's Complete Guide to the SAS Macro Language, Third Edition, SAS Institute, Cary.
3. PROC SQL: Beyond the Basics Using SAS®, Third Edition, SAS Institute, Cary.



## SAS INTERNAL REFERENCE

LAB2; C1 – MC1V2, C2 – SQ1M6; Exam Weightage – 50:50

### PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	3	2	3	3
CO 2	3	2	3	2	2
CO 3	3	3	3	3	3
CO 4	2	3	3	3	3
CO 5	3	3	2	3	3
Avg.	2.8	2.8	2.6	2.8	2.8

### PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Understand and perform text substitution in SAS code	PSO1, PSO2, PSO3, PSO4, PSO5	K1, K2, K3, K4, K5
CO2	Identify and use macro variables and macro functions	PSO1, PSO2, PSO3, PSO4, PSO5	K1, K2, K3, K4, K5
CO3	Write self-modifying and data-driven programs	PSO1, PSO2, PSO3, PSO4, PSO5	K1, K2, K3, K4, K5
CO4	Create data-driven macro variables using query	PSO1, PSO2, PSO3, PSO4, PSO5	K1, K2, K3, K4, K5, K6
CO5	Implement DBMS data with SAS/Access technology	PSO1, PSO2, PSO3, PSO4, PSO5	K1, K2, K3, K4, K5

**K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create**

<b>PROGRAMME: B.Sc., DATA ANALYTICS</b>	<b>BATCH: 2024 - 25</b>
<b>PART: III</b>	<b>COURSE COMPONENT: ALLIED - II</b>
<b>COURSE NAME: STATISTICS I</b>	<b>COURSE CODE:</b>
<b>SEMESTER: II</b>	<b>MARKS:100</b>
<b>CREDITS: 5</b>	<b>TOTAL HOURS: 90</b>
<b>THEORY AND PROBLEMS</b>	

### **COURSE OBJECTIVE:**

To understand about data and use various statistical techniques to measure the compare the relation between data points.

### **COURSE OUTCOMES:**

1. Recall the basics of statistical data, concepts of diagrams, graphs, meaning of mean, averages skewness.
2. Understand the concept of Statistical data representation in graph, location of measure, Skewness and curve fitting.
3. Apply the concepts of data in various types of graphical representation, various types of averages and deviations, moments with skewness and equation of straight lines.
4. Analyze graphical representation, measures of central tendency and dispersion, skewness, moments and curve fitting.
5. Evaluate different types of graphical methods, measures of central tendency and dispersion, Bowley's and Pearson's coefficient of skewness, curve fitting.

### **UNIT I (18 Hours)**

**Introduction to Statistics:** Definition, Characteristics, Graphical Representation of data : Bar charts, Pie diagrams, Histograms, Frequency polygon, Ogives.

Chapter 4,4.1-4.4

### **UNIT II (18 Hours)**

**Measures of Central Tendency:** Mean, Median, Mode - graphical location of median, quartiles, deciles, percentiles–relation among arithmetic mean, geometric mean and harmonic mean.

Chapter 5,5.1-5.8

### **UNIT III (18 Hours)**

**Measures of Dispersion:** Range, Mean deviation, Quartile deviation, Standard deviation - Coefficient of variation, Inter quartile deviation, Mean Absolute deviation.

Chapter 6,6.1-6.4

### **UNIT IV (18 Hours)**

**Skewness and Kurtosis:** Pearson's coefficient of skewness, Bowley's coefficient of Skewness, Moments, Relation between moments about mean in terms of moments about point, Pearson's coefficients coefficient of skewness based upon moments.

Chapter 7.7.1-7.25

### **UNIT V (18 Hours)**

**Curve fitting:** Principle of least squares, Fitting of straight line, parabola, exponential and power curve.

Chapter 15,15.1-15.3

**PRESCRIBED BOOK:**

Statistical methods and numerical methods by P.R.Vittal

**REFERENCE BOOK:**

1. New Mathematical statistics - Sanjay Arora & Bansilal (2002), Meerat Publications, New Delhi
2. Fundamentals of Mathematical Statistics - Gupta,S.C. and Kapoor, V.K.(2000): 10/e, Sultan Chand & Sons
3. Basic Statistics - 3/Agarwal .B.L (1996): e ,New Age International(P) Ltd

**E-LEARNING RESOURCES:**

1. <https://nptel.ac.in/courses/109104182>
2. <https://www.mit.edu/search/?q=statistics+#gsc.tab=0&gsc.q=statistics%20&gsc.page=1>

**GUIDELINES TO THE QUESTION PAPER SETTERS****QUESTION PAPER PATTERN**

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions (each in 50 words)	1 - 12	3	30
B	Answer any 5 out of 7 questions (each in 300 words)	13 - 19	6	30
C	Answer any 4 out of 6 questions (each in 1200 words)	20 - 25	10	40
<b>TOTAL MARKS</b>				<b>100</b>

**BREAK UP OF QUESTIONS FOR THEORY**

UNITS	SECTION A		SECTION B		SECTION C	
	THEORY	PROBLEM	THEORY	PROBLEM	THEORY	PROBLEM
I	1	1	-	1	-	1
II	1	1	-	1	-	1
III	1	1	-	1	-	1
IV	1	1	-	1	-	1
V		2	-	1	-	1
Any Unit	-	2		2	-	1
TOTAL	4	8		7	-	6
	SECTION A - 12		SECTION B - 7		SECTION C - 6	

### PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	2	3	3
CO 2	2	2	3	2	2
CO 3	2	3	2	3	2
CO 4	3	3	3	2	3
CO 5	2	2	2	3	2
Ave.	2.4	2.6	2.4	2.6	2.4

### PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Recall the basics of statistical data, concepts of diagrams, graphs, meaning of mean, averages skewness.	1-5	K1
CO2	Understand the concept of Statistical data representation in graph, location of measure, Skewness and curve fitting.	1-5	K1, K2
CO3	Apply the concepts of data in various types of graphical representation, various types of averages and deviations, moments with skewness and equation of straight lines.	1-5	K3
CO4	Analyze graphical representation, measures of central tendency and dispersion, skewness, moments and curve fitting.	1-5	K3, K4
CO5	Evaluate different types of graphical methods, measures of central tendency and dispersion, Bowley's and Pearson's coefficient of skewness, curve fitting.	1-5	K5

**K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create**

<b>PROGRAMME: B.Sc., DATA ANALYTICS</b>	<b>BATCH: 2024 -2027</b>
<b>PART: IV</b>	<b>COURSE COMPONENT: NON-MAJOR ELECTIVE-II</b>
<b>COURSE NAME: PRACTICAL - E-COMMERCE LAB</b>	<b>COURSE CODE:</b>
<b>SEMESTER: II</b>	<b>MARKS:100</b>
<b>CREDITS: 2</b>	<b>TOTAL HOURS:30</b>
<b>PRACTICAL</b>	

**COURSE OBJECTIVE:**

To understand and demonstrate how to design, develop and implement ecommerce web applications.

**COURSE OUTCOME:**

1. Understand basic HTML tags
2. Create table tag
3. Familiarize with Hyperlink and Images
4. Implementation of Frames
5. Design Forms and Controls

**EXERCISES:**

1. Implements basic HTML tags
2. Creation of List
3. Working with Hyperlink, Images
4. Implementation of Table tag
5. Implementation of FRAMES
6. Working with forms and controls

**PSO – CO mapping**

	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO 1</b>	3	2	3	3	3
<b>CO 2</b>	2	2	3	2	2
<b>CO 3</b>	3	3	3	2	3
<b>CO 4</b>	2	3	3	3	3
<b>CO 5</b>	3	3	2	3	3
<b>Avg.</b>	2.6	2.6	2.8	2.6	2.8

**PSO-CO-question paper mapping**

<b>CO No:</b>	<b>COURSE OUTCOME</b>	<b>PSOs ADDRESSED</b>	<b>COGNITIVE LEVEL (K1 to K6)</b>
CO1	Understand basic HTML tags	PSO1,PSO2,PSO3, PSO4,PSO5	K1,K2
CO2	Create table tag	PSO1,PSO2,PSO3, PSO4,PSO5	K2
CO3	Familiarize with Hyperlink and Images	PSO1,PSO2,PSO3, PSO4,PSO5	K3
CO4	Implementation of Frames	PSO1,PSO2,PSO3, PSO4,PSO5	K4
CO5	Design Forms and Controls	PSO1,PSO2,PSO3, PSO4,PSO5	K5, K6

**K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create**

## **SEMESTER - III**

<b>PROGRAMME: B.Sc., DATA ANALYTICS</b>	<b>BATCH: 2024 -2027</b>
<b>PART: III</b>	<b>COURSE COMPONENT: CORE – V</b>
<b>COURSE NAME: BIG DATA ANALYTICS</b>	<b>COURSE CODE:</b>
<b>SEMESTER: III</b>	<b>MARKS:100</b>
<b>CREDITS: 4</b>	<b>TOTAL HOURS:90</b>
<b>THEORY</b>	

**COURSE OBJECTIVE:**

To equip students with the necessary knowledge in Predictive Analytics and Descriptive Analytics.

**COURSE OUTCOMES:**

1. Understand Big data basics.
2. Familiarize Data Analytics Lifecycle.
3. Understand Advanced Analytical Theory and Methods.
4. Study Linear Regression.
5. Elucidate Time Series Analysis.

**UNIT-I :** **(18 Hours)**

Introduction to Big Data Analytics-Big Data Overview-Data Structures-Analyst Perspective on Data Repositories-State of the Practice in Analytics: BI Versus Data Science, Current Analytical Architecture, Drivers of Big Data, Emerging Big Data Ecosystem and a New Approach to Analytics,

**UNIT-II:** **(18 Hours)**

Key Roles for the New Big Data Ecosystem-Examples of Big Data Analytics.Data Analytics Lifecycle: Key Roles for a Successful Analytics Project, Overview of Data Analytics Lifecycle: Discovery, Data Preparation, Model Planning, Model Building, Communicate Results, Operationalize.

**UNIT-III:** **(18 Hours)**

Advanced Analytical Theory and Methods: Clustering - Overview of Clustering- K-means- Use Cases- Overview of the Method- Determining the Number of Clusters- Diagnostics. Association Rules- A priori Algorithm- Evaluation of Candidate Rules- Applications of Association Rules- Example: Transactions in a Grocery Store- Frequent Itemset Generation- Rule Generation and Visualization- Rule Generation and Visualization.

**UNIT-IV:** **(18 Hours)**

Linear Regression –use cases- Model Description- Logistic Regression- Decision Trees- Overview of a Decision Tree- The General Algorithm- Decision Tree Algorithms- Evaluating a Decision Tree- Bayes' Theorem- Diagnostics of Classifiers

**UNIT-V:** **(18 Hours)**

Time Series Analysis: Overview of Time Series Analysis- Box-Jenkins Methodology- Text Analysis- Text Analysis Steps- MapReduce and Hadoop: MapReduce- Apache Hadoop- The Hadoop Ecosystem: Pig, Hive, Hbase, Mahout.

**PRESCRIBED BOOK:**

1. Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data Published by John Wiley & Sons, Inc. 10475 Crosspoint Boulevard, Indianapolis, by John Wiley & Sons, Inc., Indianapolis, Indiana



**REFERENCES BOOKS:**

1. Michael Minelli, Michele Chambers, 2013, Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses, Wiley CIO.
2. Stephan Kudyba, 2014, Big Data, Mining and Analytics: Components of Strategic Decision Making, CRC Press.

**E-LEARNING RESOURCES:**

1. <https://support.sas.com/content/dam/SAS/support/en/books/analytics-in-a-big-data-world/table-of-contents.pdf>
2. <https://www.geeksforgeeks.org/data-analytics-and-its-type>
3. <https://www.datapine.com/blog/data-analysis-methods-and-techniques>
4. <https://www.simplilearn.com/data-analysis-methods-process-types-article>
5. <https://indiafreenotes.com/missing-values-standardizing-data-data-categorization-weights-of-evidence-coding-variable-selection-data-segmentation>

**GUIDELINES TO THE QUESTION PAPER SETTERS****QUESTION PAPER PATTERN**

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
<b>A</b>	<i>Answer any 10 out of 12 questions (each in 50 words)</i>	<i>1-12</i>	<i>3</i>	<i>30</i>
<b>B</b>	<i>Answer any 5 out of 7 questions (each in 300 words)</i>	<i>13-19</i>	<i>6</i>	<i>30</i>
<b>C</b>	<i>Answer any 4 out of 6 questions (each in 1200 words)</i>	<i>20-25</i>	<i>10</i>	<i>40</i>
<b>TOTAL MARKS</b>				<b>100</b>

**BREAK UP OF QUESTIONS**

UNITS	SECTION A	SECTION B	SECTION C
I	3	2	2
II	3	2	1
III	2	1	1
IV	2	1	1
V	2	1	1
<b>TOTAL</b>	<b>12</b>	<b>7</b>	<b>6</b>
<b>SECTION A – 12</b>		<b>SECTION B - 7</b>	<b>SECTION C - 6</b>

**PSO – CO mapping**

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	3	3	3
CO 2	3	2	3	3	2
CO 3	3	3	3	2	2
CO 4	3	3	3	2	3
CO 5	3	3	3	3	3
Avg.	3	2.8	3	2.6	2.6

**PSO-CO-question paper mapping**

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Understand Big data basics.	PSO 1 TO PSO 5	K1
CO2	Familiarize Data Analytics Lifecycle.	PSO 1 TO PSO 5	K2
CO3	Understand Advanced Analytical Theory and Methods.	PSO 1 TO PSO 5	K3
CO4	Study Linear Regression.	PSO 1 TO PSO 5	K4
CO5	Elucidate Time Series Analysis.	PSO 1 TO PSO 5	K5, K6

**K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create**

<b>PROGRAMME: B.Sc., DATA ANALYTICS</b>	<b>BATCH: 2024 -2027</b>
<b>PART: III</b>	<b>COURSE COMPONENT: CORE – VI</b>
<b>COURSE NAME: DATABASE MANAGEMENT SYSTEMS</b>	<b>COURSE CODE:</b>
<b>SEMESTER: III</b>	<b>MARKS:100</b>
<b>CREDITS: 4</b>	<b>TOTAL HOURS:90</b>
<b>THEORY</b>	

**COURSE OBJECTIVE:**

To understand the fundamental concepts of Database Management Systems and work with SQL.

**COURSE OUTCOMES:**

1. Demonstrate the basic elements of a relational database management system
2. Ability to identify the data models for relevant problems
3. Ability to design entity relationships and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respect data
4. Apply normalization for the development of application software
5. Implement the basics of SQL and construct queries using SQL

**UNIT I (18 HOURS)**

Databases and Database Users: Introduction – Characteristics of Database Approach – Actors of the Scene- Workers behind the scene – Advantages of using the DBMS Approach – Database System Concepts and Architecture : Three Schema Architecture and Data Independence – DBMS Languages.

**UNIT II (18 HOURS)**

Data Modelling Using Entity Relationship Model : Entities, Attributes, Entity types, Entity Sets, Keys and Value Sets, Relationship types, Relationship sets, roles and structural constraints, Weak Entity types – ER Diagrams, Naming Conventions, Design Issues - Notation for ER Diagrams – Alternative Notations for ER Diagrams – Enhanced Entity- Relationship Model : Specialization and Generalization (Basic concepts alone with example)

**UNIT III (18 HOURS)**

Basics of Functional Dependencies and Normalization for Relational Databases: Informal Design Guidelines for Relation Schemas – Functional Dependencies -Normal Forms based on General Definitions of Second and Third Normal form-Boyce Code Normal form.

**UNIT IV (18 HOURS)**

Basic SQL - SQL Data Definition and Data Types – Specifying Constraints in SQL- Basic Retrieval Queries in SQL - INSERT, DELETE, and UPDATE Statements in SQL - More SQL: More Complex SQL Retrieval Queries – Views (Virtual Tables) in SQL.

**UNIT V (18 HOURS)**

Introduction to Transaction Processing Concepts and Theory: Desirable Properties of Transactions (ACID Properties). Database Recovery Techniques: Recovery Concepts- No-Undo / Redo Recovery based on Deferred Update – Database Backup and Recovery from Catastrophic Failures - Database Security: Introduction to Database Security Issues - Challenges to Maintaining Database Security.

**PRESCRIBED BOOKS:**

1. Ramez Elmasri & Shamkant B. Navathe, Fundamentals of Database systems, 7th Edition , Pearson 2016.

**REFERENCE BOOKS:**

1. H. F. Korth & A. Silverschatz, Database Concepts, Tata McGraw Hill, New Delhi
2. C. J. Date, Database Systems, Prentice Hall of India, New Delhi.
3. Ivan Bayross, SQL, PL/SQL, The programming language of Oracle.

**E-LEARNING RESOURCES:**

1. <https://www.geeksforgeeks.org/dbms/>
2. <https://www.guru99.com/dbms-tutorial.html>
3. <https://www.javatpoint.com/dbms-tutorial>
4. <https://byjus.com/govt-exams/database-management-system-dbms/>
5. <https://beginnersbook.com/2015/04/dbms-tutorial/>

**GUIDELINES TO THE QUESTION PAPER SETTERS QUESTION PAPER PATTERN**

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
<b>A</b>	<i>Answer any 10 out of 12 questions(each in 50 words)</i>	1-12	3	30
<b>B</b>	<i>Answer any 5 out of 7 questions(each in 300 words)</i>	13-19	6	30
<b>C</b>	<i>Answer any 4 out of 6 questions(each in 1200 words)</i>	20-25	10	40
<b>TOTAL MARKS</b>				<b>100</b>

**BREAK UP OF QUESTIONS**

UNITS	SECTION A	SECTION B	SECTION C
I	2	2	1
II	2	2	1
III	3	1	2
IV	3	1	1
V	2	1	1
<b>TOTAL</b>	12	7	6
<b>SECTION A – 12</b>		<b>SECTION B – 7</b>	<b>SECTION C - 6</b>

**PSO – CO mapping**

	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO 1</b>	3	3	3	3	3
<b>CO 2</b>	3	3	3	2	3
<b>CO 3</b>	3	3	3	3	2
<b>CO 4</b>	2	3	3	2	3
<b>CO 5</b>	3	3	2	2	3
<b>Avg.</b>	2.8	3	2.8	2.4	2.8

**PSO-CO-question paper mapping**

<b>CO No:</b>	<b>COURSE OUTCOME</b>	<b>PSOs ADDRESSED</b>	<b>COGNITIVE LEVEL (K1 to K6)</b>
CO1	Demonstrate the basic elements of a relational database management system	PSO1, PSO2, PSO3, PSO4, PSO5	K1
CO2	Ability to identify the data models for relevant problems	PSO1, PSO2, PSO3, PSO4, PSO5	K2
CO3	Ability to design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respect data	PSO1, PSO2, PSO3, PSO4, PSO5	K3
CO4	Apply normalization for the development of application software's	PSO1, PSO2, PSO3, PSO4, PSO5	K4
CO5	Implement the basics of SQL and construct queries using SQL	PSO1, PSO2, PSO3, PSO4, PSO5	K5, K6

**K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create**

<b>PROGRAMME: B.Sc., DATA ANALYTICS</b>	<b>BATCH: 2024 -2027</b>
<b>PART: III</b>	<b>COURSE COMPONENT: CORE – VII</b>
<b>COURSE NAME: R PROGRAMMING</b>	<b>COURSE CODE:</b>
<b>SEMESTER: III</b>	<b>MARKS:100</b>
<b>CREDITS: 4</b>	<b>TOTAL HOURS:90</b>
<b>THEORY</b>	

### **COURSE OBJECTIVE:**

To understand R is the powerful Tool for statistical analysis and mostly used for implementing various concepts of Data Science and Analytics.

### **COURSE OUTCOME:**

1. Acquire basic knowledge of R data structures
2. Demonstrate Filtering and Matrix operations
3. Illustrate List and List functions
4. Understand Data Frames and functions
5. Illustrate Factors and Tables and understand R Programming Structures

### **UNIT I: (18 Hours)**

Interactive Mode - Batch Mode - Introduction to Functions: Variable Scope, Default Arguments - R Data Structures - Scalars, Vectors, Arrays, and Matrices - Adding and Deleting Vector Elements, Obtaining the Length of a Vector - Matrices and Arrays as Vectors, Common Vector Operations - Vector Arithmetic and Logical Operations  
- Vector Indexing - Using all() and any().

### **UNIT II: (18 Hours)**

Vectorized Operations: Vector In, Vector Out - NA and NULL Values – Filtering: Generating Filtering Indices - Filtering with the subset() Function- Matrices and Arrays : Creating Matrices - General Matrix Operations: Performing Linear Algebra Operations on Matrices- Matrix Indexing - Filtering on Matrices - Applying Functions to Matrix Rows and Columns: Using the apply() Function- Finding Outliers.

### **UNIT III: (18 Hours)**

Adding and Deleting Matrix Rows and Columns: More on the Vector/Matrix Distinction - Naming Matrix Rows and Columns - Higher-Dimensional Arrays – List: Creating Lists. - General List Operations - List Indexing, Adding and Deleting List Elements, Getting the Size of a List, Accessing List Components and Values - Applying Functions to Lists: Using the lapply() and sapply() Functions, Recursive Lists.

### **UNIT IV: (18 Hours)**

Data Frames - Creating Data Frames, Accessing Data Frames - Other Matrix-Like Operations Extracting Subdata Frames - More on Treatment of NA Values - Using the rbind() and cbind() Functions - Applying apply(), Merging Data Frames - Applying Functions to Data Frames: Using lapply() and sapply() on Data Frames.

### **UNIT V: (18 Hours)**

Factors and Tables - Factors and Levels, Common Functions Used with Factors: The tapply() and Split() and By() Function- Working with Tables - Matrix/Array-Like Operations on Tables- aggregate() and cut() function - R Programming Structures - Control Statements, Arithmetic and Boolean Operators and Values, Default Values for Arguments - Return Values- Functions Are Objects- Accessing the Keyboard and Monitor - Reading and Writing Files.

**PRESCRIBED BOOKS:**

1. THE ART OF R PROGRAMMING - 2011 A Tour of Statistical, Software Design by Norman Matlof - No Starch Press
2. Statistical Analysis with R for Dummies, Joseph Schmuller, John Wiley Publication -2017.

**GUIDELINES TO THE QUESTION PAPER SETTERS QUESTION****PAPER PATTERN**

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
<b>A</b>	<i>Answer any 10 out of 12 questions(each in 50 words)</i>	<i>1-12</i>	<i>3</i>	<i>30</i>
<b>B</b>	<i>Answer any 5 out of 7 questions(each in 300 words)</i>	<i>13-19</i>	<i>6</i>	<i>30</i>
<b>C</b>	<i>Answer any 4 out of 6 questions(each in 1200 words)</i>	<i>20-25</i>	<i>10</i>	<i>40</i>
<b>TOTAL MARKS</b>				<b>100</b>

**BREAK UP OF QUESTIONS**

UNITS	SECTION A	SECTION B	SECTION C
I	2	2	1
II	2	2	1
III	3	1	2
IV	3	1	1
V	2	1	1
<b>TOTAL</b>	<b>12</b>	<b>7</b>	<b>6</b>
<b>SECTION A – 12</b>		<b>SECTION B – 7</b>	<b>SECTION C - 6</b>

**PSO – CO mapping**

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
<b>CO 1</b>	3	3	3	3	3
<b>CO 2</b>	3	3	3	2	3
<b>CO 3</b>	3	3	3	3	2
<b>CO 4</b>	2	3	3	2	3
<b>CO 5</b>	3	3	2	2	3
<b>Avg.</b>	2.8	3	2.8	2.4	2.8

### PSO-CO-question paper mapping

<b>CO No:</b>	<b>COURSE OUTCOME</b>	<b>PSOs ADDRESSED</b>	<b>COGNITIVE LEVEL (K1 to K6)</b>
CO1	Acquire basic knowledge of R data structures	PSO1, PSO2, PSO3, PSO4, PSO5	K1
CO2	Demonstrate Filtering and Matrix operations	PSO1, PSO2, PSO3, PSO4, PSO5	K2
CO3	Illustrate List and List functions	PSO1, PSO2, PSO3, PSO4, PSO5	K3
CO4	Understand Data Frames and functions	PSO1, PSO2, PSO3, PSO4, PSO5	K4
CO5	Illustrate Factors and Tables and understand R Programming Structures	PSO1, PSO2, PSO3, PSO4, PSO5	K5, K6

**K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create**



<b>PROGRAMME: B.Sc., DATA ANALYTICS</b>	<b>BATCH: 2024 -2027</b>
<b>PART: III</b>	<b>COURSE COMPONENT: CORE – VIII</b>
<b>COURSE NAME: PRACTICAL-III: BIG DATA MANAGEMENT AND VISUALIZATION</b>	<b>COURSE CODE:</b>
<b>SEMESTER: III</b>	<b>MARKS:100</b>
<b>CREDITS: 4</b>	<b>TOTAL HOURS:60</b>
<b>PRACTICAL</b>	

**COURSE OBJECTIVE:**

To understand the data preparation capabilities of SAS Data Preparation in SAS Viya.

**COURSE OUTCOME:**

1. Assess visually and profile data with multiple tools for better understanding of quality issues.
2. Change the structure and cleanse data without using code.
3. Utilize SAS Visual Analytics for SAS Viya.
4. Understand restructuring of data for analytics using SAS Data Studio.
5. Create advanced analyses using SAS Visual Analytics.

**EXERCISES:**

- Accessing, Importing, and Loading Data using SAS Viya
- Preparing data for analytics using SAS Viya tools
- Preparing Data in SAS Data Studio
- Analyzing Data in SAS Visual Analytics
- Designing Reports with SAS Visual Analytics
- Restructuring Data for Geographic Mapping in SAS Data Studio
- Restructuring Data for Forecasting in SAS Data Studio
- Performing Path Analysis in SAS Viya
- Performing Text Analytics in SAS Viya
- Exploring advanced options in SAS Viya

**Course Materials**

SAS Company Manual

**Reference Text**

SAS Internal Reference

**PSO – CO mapping**

	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO 1</b>	3	3	2	3	3
<b>CO 2</b>	3	2	3	2	2
<b>CO 3</b>	3	3	3	3	3
<b>CO 4</b>	2	3	3	3	3
<b>CO 5</b>	3	3	2	3	3
<b>Avg.</b>	2.8	2.8	2.8	2.8	2.8

**PSO-CO-question paper mapping**

<b>CO No:</b>	<b>COURSE OUTCOME</b>	<b>PSOs ADDRESSED</b>	<b>COGNITIVE LEVEL (K1 to K6)</b>
CO1	Assess visually and profile data with multiple tools for better understanding of quality issues	PSO1, PSO2, PSO3, PSO4, PSO5	K1, K2, K3, K4, K5
CO2	Change the structure and cleanse data without using code	PSO1, PSO2, PSO3, PSO4, PSO5	K1, K2, K3, K4, K5
CO3	Utilize SAS Visual Analytics for SAS Viya	PSO1, PSO2, PSO3, PSO4, PSO5	K1, K2, K3, K4, K5
CO4	Understand restructuring of data for analytics using SAS Data Studio	PSO1, PSO2, PSO3, PSO4, PSO5	K1, K2, K3, K4, K5, K6
CO5	Create advanced analyses using SAS Visual Analytics	PSO1, PSO2, PSO3, PSO4, PSO5	K1, K2, K3, K4, K5, K6

**K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create**

<b>PROGRAMME: B.Sc. DATA ANALYTICS</b>	<b>BATCH: 2024 - 25</b>
<b>PART: III</b>	<b>COURSE COMPONENT: ALLIED III</b>
<b>COURSE NAME: STATISTICS II</b>	<b>COURSE CODE:</b>
<b>SEMESTER: III</b>	<b>MARKS:100</b>
<b>CREDITS: 5</b>	<b>TOTAL HOURS: 90</b>
<b>THEORY AND PROBLEMS</b>	

**COURSE OBJECTIVE:**

To understand and use the mathematical knowledge in optimal use of resources.

**COURSE OUTCOMES:**

1. Recall the variables and mathematical expectation from real world problems and probability distributions, correlation, regression, test of significance.
2. Understand Mathematical expectation, Identify and use them to solve real life problems using probability models and distributions. Also use correlation and regression and test of significance.
3. Apply real-world problems into probability models. Discuss the concepts of Probability, conditional probability and Baye's theorem and its applications.
4. Analyse and Discuss Probability distributions, correlation and regression, various test and Anova.
5. Evaluate variables, probability distributions, correlation, regression lines and test of hypothesis.

**UNIT I**

**(18 Hours)**

**Random Variables and Expectation:** Discrete Random Variables, Continuous Random Variables, Definition of Mathematical Expectation.

Chapter 9,9.1,9.2, Chapter 10,10.1,10.2

**UNIT II**

**(18 Hours)**

**Probability:** Basic Probability, The Concept of Probability, The Axioms of Probability, Independent events, Addition theorem, Multiplication theorem, Conditional Probability, Bayes' Theorem.

Chapter 8,8.1-8.10

**UNIT III**

**(18 Hours)**

**Probability Distributions:** Binomial Distribution, Poisson distribution, Normal Distribution

Chapter 17, 17.1,17.2, Chapter 18, 18.1,18.2, Chapter 20, 20.1

**UNIT IV**

**(18 Hours)**

**Correlation:** Meaning, Applications, types of degree of correlation, Scatter diagram, Karl Pearson's Coefficient of Correlation Rank Correlation.

**Regression:** Meaning, uses, Difference correlation and regression, linear regression equations.

Chapters 13, 13.16,13.20, Chapter 14,14.14.1

**UNIT V**

**(18 Hours)**

**Tests of Hypothesis:** Meaning, types, standard hypothesis, null and alternative hypothesis, simple and composite hypothesis, Type I and Type II error, testing of hypothesis: t -test, F-test, Chi square.

Chapter 26, 26.1,26.2,26.13,26.33,Chapter 27, 27.1,27.14,27,16,27.17.

**PRESCRIBED BOOK:**

Statistical methods and numerical methods by P.R.Vittal.

### REFERENCE BOOKS:

1. New Mathematical statistics - Sanjay Arora & Bansilal (2002), Meerat Publications, New Delhi
2. Fundamentals of Mathematical Statistics - Gupta, S.C. and Kapoor, V.K. (2000): 10/e, Sultan Chand & Sons
3. Basic Statistics - 3/Agarwal .B.L (1996): e ,New Age International(P) Ltd

### E-LEARNING RESOURCES:

1. <https://ocw.mit.edu/courses/18-05-introduction-to-probability-and-statistics-spring-2022/>
2. <https://mathforums.com/advanced-probability-statistics/>
3. <https://ocw.mit.edu/courses/14-30-introduction-to-statistical-method-in-economics-spring-2006/>
4. <https://www.digimat.in/nptel/courses/video/110107114/L01.html>

### GUIDELINES TO THE QUESTION PAPER SETTERS

#### QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions (each in 50 words)	1 - 12	3	30
B	Answer any 5 out of 7 questions (each in 300 words)	13 - 19	6	30
C	Answer any 4 out of 6 questions (each in 1200 words)	20 - 25	10	40
<b>TOTAL MARKS</b>				<b>100</b>

### BREAK UP OF QUESTIONS FOR THEORY

UNITS	SECTION A		SECTION B		SECTION C	
	THEORY	PROBLEM	THEORY	PROBLEM	THEORY	PROBLEM
I	1	1	-	1	-	1
II	1	1	-	1	-	1
III	1	1	-	1	-	1
IV		2		1	-	1
V	1	1	-	1	-	1
Any Unit	-	2	-	2	-	1
TOTAL	4	8		7	-	6
	SECTION A –12		SECTION B - 7		SECTION C – 6	

### PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	3	3	2
CO 2	3	2	3	2	3
CO 3	2	3	2	3	2
CO 4	3	3	3	2	3
CO 5	3	2	3	3	3
Ave.	2.8	2.6	2.8	2.6	2.6

### PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESS ED	COGNITIVE LEVEL (K1 to K6)
CO1	Recall the variables and mathematical expectation from real world problems and probability distributions, correlation, regression, test of significance.	1-5	K1
CO2	Understand Mathematical expectation, Identify and use them to solve real life problems using probability models and distributions. Also use correlation and regression and test of significance.	1-5	K1, K2
CO3	Apply real-world problems into probability models. Discuss the concepts of Probability, conditional probability and Baye's theorem and its applications.	1-5	K3
CO4	Analyse and Discuss Probability distributions, correlation and regression, various test and Anova.	1-5	K3,K4
CO5	Evaluate variables, probability distributions, correlation, regression lines and test of hypothesis.	1-5	K5

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

## **SEMESTER – IV**

<b>PROGRAMME: B.Sc., DATA ANALYTICS</b>	<b>BATCH: 2024 -2027</b>
<b>PART: III</b>	<b>COURSE COMPONENT: CORE – IX</b>
<b>COURSE NAME: DATA MINING AND DATA WAREHOUSING</b>	<b>COURSE CODE:</b>
<b>SEMESTER: IV</b>	<b>MARKS:100</b>
<b>CREDITS: 4</b>	<b>TOTAL HOURS:75</b>
<b>THEORY</b>	

**COURSE OBJECTIVE:**

To equip students with the necessary knowledge in Data Mining Techniques.

**COURSE OUTCOMES:**

1. Understand basic Data Mining concepts
2. Acquire knowledge on Classification algorithms
3. Familiarize Clustering Algorithms and Association rules
4. Understand and evaluate Decision Support Systems
5. Illustrate Data warehouse Environment

**UNIT I (15 Hours)**

Introduction: Basics of Data Mining – Data Mining Versus Knowledge Discovery in Database– Data Mining Issues – Data Mining Metrics – Social Implications of Data Mining – Data Mining from a Database Perspective. Related Concepts: Database/OLTP Systems – Fuzzy Sets and Fuzzy Logic – Information Retrieval –Decision Support Systems.

**UNIT II (15 Hours)**

Dimensional Modelling – OLAP – Web Search Engines. Data Mining Techniques: Introduction – A Statistical Perspective on Data Mining – Similarity Measures – Decision Trees – Neural Networks – Genetic Algorithms – Classification: Introduction – Statistical Based Algorithms – Distance Based Algorithms – Decision Tree Based Algorithms.

**UNIT III (15 Hours)**

Neural Network Based Algorithms – Rule Based Algorithms. Clustering: Introduction – Similarity and Distance Measures – Hierarchical Algorithms – Partitional Algorithms – Clustering Large Database. Association Rules: Introduction – Large Item sets – Basic Algorithms – Parallel and Distributed Algorithms.

**UNIT IV (15 Hours)**

Comparing Approaches – Incremental Rules – Advanced Association Rule Techniques – Measuring the Quality of Rule Techniques – Measuring the Quality of Rules. Evolution of Decision Support Systems: The Evolution-Problems with naturally Evolving Architecture-The development life cycle- Patterns of Hardware Utilization- setting the stage for Re-engineering.

**UNIT V (15 Hours)**

The Data warehouse Environment: the structure of the Data ware house –Granularity-Exploration and Data Mining – Living sample database – Structuring data in the Data ware house-Auditing and the Data warehouse- Incorrect Data in the Data warehouse.



**PRESCRIBED BOOKS:**

1. Data Mining Introductory and Advanced Topics, Margaret H. Dunham, Pearson Education [LPE] First Impression, 2006.
2. Building the Data Warehouse, W.H. Inmon, Wiley Publishing, Inc. Fourth Edition, 2005.

**REFERENCE BOOKS:**

1. Data Warehousing in the Real World, Sam Anahory, Dennis Murray, Pearson Education [LPE], Thirteenth India. Reprint, 2005.
2. Data Mining Concepts and Techniques, Jiawei Han, Micheline Kamber, Jian Pei, Morgan-Kaufmann series, Third Edition, 2012.

**E-LEARNING RESOURCES:**

1. [https://www.vssut.ac.in/lecture\\_notes/lecture1428550844.pdf](https://www.vssut.ac.in/lecture_notes/lecture1428550844.pdf)
2. <https://www.spiceworks.com/tech/big-data/articles/what-is-data-mining>
3. <https://web.pdx.edu/~nauna/week7b-neuralnetwork.pdf>
4. <https://slideplayer.com/slide/5069586>
5. <https://www.srividyaengg.ac.in/coursematerial/CSE/104661.pdf>

**GUIDELINES TO THE QUESTION PAPER SETTERS****QUESTION PAPER PATTERN**

<b>SECTION</b>	<b>QUESTION COMPONENT</b>	<b>NUMBERS</b>	<b>MARKS</b>	<b>TOTAL</b>
<b>A</b>	<i>Answer any 10 out of 12 questions (each in 50 words)</i>	<i>1-12</i>	<i>3</i>	<i>30</i>
<b>B</b>	<i>Answer any 5 out of 7 questions (each in 300 words)</i>	<i>13-19</i>	<i>6</i>	<i>30</i>
<b>C</b>	<i>Answer any 4 out of 6 questions (each in 1200 words)</i>	<i>20-25</i>	<i>10</i>	<i>40</i>
<b>TOTAL MARKS</b>				<b>100</b>

### PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	3	3	3
CO 2	3	2	3	3	2
CO 3	3	3	3	2	2
CO 4	3	3	3	2	3
CO 5	3	3	3	3	3
Avg.	3	2.8	3	2.6	2.6

### BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	2	2
II	3	2	1
III	2	1	1
IV	2	1	1
V	2	1	1
<b>TOTAL</b>	12	7	6
<b>SECTION A – 12</b>		<b>SECTION B - 7</b>	<b>SECTION C - 6</b>

### PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Understand basic Data Mining concepts	PSO 1 TO PSO 5	K1
CO2	Acquire knowledge on Classification algorithms	PSO 1 TO PSO 5	K2
CO3	Familiarize Clustering Algorithms and Association rules	PSO 1 TO PSO 5	K3
CO4	Understand and evaluate Decision Support Systems	PSO 1 TO PSO 5	K4
CO5	Illustrate Data warehouse Environment	PSO 1 TO PSO 5	K5, K6

**K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create**

<b>PROGRAMME: B.Sc., DATA ANALYTICS</b>	<b>BATCH: 2024 -2027</b>
<b>PART: III</b>	<b>COURSE COMPONENT: CORE – X</b>
<b>COURSE NAME: ADVANCED PYTHON PROGRAMMING</b>	<b>COURSE CODE:</b>
<b>SEMESTER: IV</b>	<b>MARKS:100</b>
<b>CREDITS: 3</b>	<b>TOTAL HOURS:75</b>
<b>THEORY</b>	

**COURSE OBJECTIVE:**

To equip students with a solid understanding of the Python programming language and its applications.

**COURSE OUTCOMES:**

1. Understand python programming basics and data types
2. Demonstrate database connectivity
3. Evaluate the concept of Dates and Times
4. Implement Machine Learning using python
5. Demonstrate data visualization

**UNIT I :**

**(15 Hours)**

Introduction to Python - basic of Python – Data Types – Operators- List- Dictionaries Tuple-series-Data frame-Panels -Vectors, Matrices, and Arrays : creating a vector, matrix, sparse matrix, applying operation to elements, Average, Variance, and Standard Deviation, Reshaping Arrays, Addition subtraction and multiplication with matrix.

**UNIT II :**

**(15 Hours)**

Loading Datasets, loading a CSV, Database connectivity, Data Wrangling: creating and working with data frames- Finding unique values, handling missing values - working with rows and column-merging data frames. - Handling Numerical Data: Normalizing Observations, Transforming Features, Detecting Outliers, Handling Outliers.

**UNIT III :**

**(15 Hours)**

Handling Categorical Data: Encoding Nominal, ordinal Categorical and dictionaries of features. Handling Text: Cleaning Text, Tokenizing Text -Handling Dates and Times: Converting Strings to Dates, Handling Time Zones, Selecting Dates and Times, Encoding Days of the Week. Handling Images: Loading, Saving, Resizing, Cropping, and Blurring Images.

**UNIT IV:**

**(15 Hours)**

Implementing Machine Learning using python: supervised and unsupervised learning, Regression: Linear Regression, Multiple Linear Regression, Decision Trees, Classification: Logistic Regression.

**UNIT V:**

**(15 Hours)**

Data Visualization: Direct Plotting - Seaborn Plotting System - Matplotlib Plot – Naive Bayes basics- Neural Networks basics , K Nearest Neighbors, Decision Tree classification. Clustering- Means clustering.

**PRESCRIBED BOOKS:**

1. Machine Learning with Python Cookbook Practical Solutions from Preprocessing to Deep Learning, by Chris Albon. All rights reserved. Printed in the United States of America. Published by O'Reilly Media, Inc.,
2. Data Analysis From Scratch With python ,Step By Step Guide by Peters Morgan
3. Data Analysis and Visualization Using Python Analyze Data to Create Visualizations for BI Systems by Dr. Ossama Embarak-Apress .

**REFERENCE BOOKS:**

1. Head First Python Programming By Paul Barry and David Griffythis O'Reilly.

**E-LEARNING RESOURCES:**

1. <https://www.javatpoint.com/python-variables>
2. [https://www.w3schools.com/python/python\\_strings.asp](https://www.w3schools.com/python/python_strings.asp)
3. [https://www.tutorialspoint.com/python/python\\_features.htm](https://www.tutorialspoint.com/python/python_features.htm)
4. <https://www.geeksforgeeks.org/python-lists/?ref=lbp>
5. <https://www.coursera.org/courses?query=python%20for%20beginners>

**GUIDELINES TO THE QUESTION PAPER SETTERSQUESTION****PAPER PATTERN**

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
<b>A</b>	<i>Answer any 10 out of 12 questions(each in 50 words)</i>	1-12	3	30
<b>B</b>	<i>Answer any 5 out of 7 questions(each in 300 words)</i>	13-19	6	30
<b>C</b>	<i>Answer any 4 out of 6 questions(each in 1200 words)</i>	20-25	10	40
<b>TOTAL MARKS</b>				<b>100</b>

**BREAK UP OF QUESTIONS**

UNITS	SECTION A	SECTION B	SECTION C
I	3	1	1
II	3	2	1
III	2	1	2
IV	2	2	1
V	2	1	1
<b>TOTAL</b>	12	7	6
<b>SECTION A – 12</b>		<b>SECTION B – 7</b>	<b>SECTION C - 6</b>

**PSO – CO mapping**

	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO 1</b>	3	3	3	3	2
<b>CO 2</b>	3	3	3	2	3
<b>CO 3</b>	3	2	3	3	3
<b>CO 4</b>	3	3	3	2	3
<b>CO 5</b>	3	3	2	3	3
<b>Avg.</b>	3	2.8	2.8	2.6	2.8

**PSO-CO-question paper mapping**

<b>CO No:</b>	<b>COURSE OUTCOME</b>	<b>PSOs ADDRESSED</b>	<b>COGNITIVE LEVEL (K1 to K6)</b>
CO1	Understand python programming basics and data types	PSO1, PSO2, PSO3, PSO4, PSO5	K1,K2,K3,K4,K5, K6
CO2	Demonstrate database connectivity	PSO1, PSO2, PSO3, PSO4, PSO5	K1,K2,K3,K4,K5, K6
CO3	Evaluate the concept of Dates and Times	PSO1, PSO2, PSO3, PSO4, PSO5	K1,K2,K3,K4,K5, K6
CO4	Implement Machine Learning using python	PSO1, PSO2, PSO3, PSO4, PSO5	K1,K2,K3,K4,K5, K6
CO5	Demonstrate data visualization	PSO1, PSO2, PSO3, PSO4, PSO5	K1,K2,K3,K4,K5, K6

**K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create**

<b>PROGRAMME: B.Sc., DATA ANALYTICS</b>	<b>BATCH: 2024 -2027</b>
<b>PART: III</b>	<b>COURSE COMPONENT: CORE – XI</b>
<b>COURSE NAME: DATA STRUCTURES AND ALGORITHMS</b>	<b>COURSE CODE:</b>
<b>SEMESTER: IV</b>	<b>MARKS:100</b>
<b>CREDITS: 4</b>	<b>TOTAL HOURS:90</b>
<b>THEORY</b>	

**COURSE OBJECTIVE:**

To understand and implement basic concepts of data structures and algorithms.

**COURSE OUTCOMES:**

1. Apply Concepts of Stacks, Queues, Linked Lists.
2. Ability to assess efficiency trade-offs among different data structure implementations or combinations.
3. Develop Programs for Searching and Sorting, Trees.
4. Interpret concepts of trees.
5. Develop programs for Sorting and Searching.

**UNIT I (18 HOURS)**

**Introduction To Algorithms And Data Structures :** Algorithms: Definition, Properties, Performance Analysis-Space Complexity, Time Complexity, Asymptotic Notations. Data structures: Introduction, Data Structures types, DS Operations.

**UNIT II (18 HOURS)**

Stacks: Introduction, Stack Operations, Applications: Infix to Postfix Conversion, Evaluation of Postfix Expression. Queues: Introduction, Operations on queues, Circular queues.

**UNIT III (18 HOURS)**

Linked lists: Introduction, Singly linked lists, Circular linked lists, Doubly linked lists, Applications:

Polynomial Representation, polynomial addition.

**UNIT IV (18 HOURS)**

Trees and graphs: Introduction, Definition and basic terminologies, tree representation, binary tree, binary tree representation, binary tree traversal, graph definition, representation, graph traversal, single source shortest path, all-pairs shortest path.

**UNIT V (18 HOURS)**

Sorting: Introduction, Selection sort, Bubble sort, Insertion sort, Merge sort, Quick sort, Heap Sort. Searching: Introduction, Linear search, Binary search

**PRESCRIBED BOOKS:**

1. G.A.V PAI, Data Structures and Algorithms, Concepts, Techniques and Applications, Volume1, 1stEdition, Tata McGraw-Hill, 2008.
2. Richard F. Gilberg& Behrouz A. Forouzan, Data Structures, Pseudo code Approach with C, 2ndEdition, Cengage Learning India Edition, 2007.
3. Horowitz and Sahani, Fundamentals of Computer Algorithms, 2ND Edition, 2012.

**REFERENCE BOOKS:**

1. Langsam, M. J. Augenstein, A. M. Tanenbaum, Datastructures using C and C++, 2nd Edition, PHI Education, 2008.
2. Sartaj Sahni, Ellis Horowitz, Fundamentals of Data Structures in C, 2nd Edition, Orientblackswan, 2010.

**E-LEARNING RESOURCES:**

1. <https://www.geeksforgeeks.org/data-structures/>
2. <https://www.programiz.com/dsa>
3. <https://www.w3schools.in/data-structures-tutorial/intro/>

**GUIDELINES TO THE QUESTION PAPER SETTERS****QUESTION PAPER PATTERN**

<b>SECTION</b>	<b>QUESTION COMPONENT</b>	<b>NUMBERS</b>	<b>MARKS</b>	<b>TOTAL</b>
<b>A</b>	<i>Answer any 10 out of 12 questions(each in 50 words)</i>	<i>1-12</i>	<i>3</i>	<i>30</i>
<b>B</b>	<i>Answer any 5 out of 7 questions(each in 300 words)</i>	<i>13-19</i>	<i>6</i>	<i>30</i>
<b>C</b>	<i>Answer any 4 out of 6 questions(each in 1200 words)</i>	<i>20-25</i>	<i>10</i>	<i>40</i>
<b>TOTAL MARKS</b>				<b>100</b>

**BREAK UP OF QUESTIONS**

<b>UNITS</b>	<b>SECTION A</b>	<b>SECTION B</b>	<b>SECTION C</b>
<b>I</b>	2	2	1
<b>II</b>	2	2	1
<b>III</b>	3	1	2
<b>IV</b>	3	1	1
<b>V</b>	2	1	1
<b>TOTAL</b>	12	7	6
<b>SECTION A – 12</b>		<b>SECTION B – 7</b>	<b>SECTION C - 6</b>

### PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	3	3	3	3
CO 2	3	2	3	2	3
CO 3	3	3	2	3	2
CO 4	3	3	3	3	3
CO 5	2	3	3	2	3
Avg.	2.8	2.8	2.8	2.6	2.8

### PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Apply Concepts of Stacks, Queues, Linked Lists.	PSO1, PSO2, PSO3, PSO4, PSO5	K1
CO2	Ability to assess efficiency trade-offs among different data structure implementations or combinations.	PSO1, PSO2, PSO3, PSO4, PSO5	K2
CO3	Develop Programs for Searching and Sorting, Trees.	PSO1, PSO2, PSO3, PSO4, PSO5	K3
CO4	Interpret concepts of trees.	PSO1, PSO2, PSO3, PSO4, PSO5	K4
CO5	Develop programs for Sorting and Searching.	PSO1, PSO2, PSO3, PSO4, PSO5	K5, K6

**K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create**



<b>PROGRAMME: B.Sc., DATA ANALYTICS</b>	<b>BATCH: 2024 -2027</b>
<b>PART: III</b>	<b>COURSE COMPONENT: CORE – XII</b>
<b>COURSE NAME: PRACTICAL - IV – APPLIED STATISTICAL MODELLING</b>	<b>COURSE CODE:</b>
<b>SEMESTER: IV</b>	<b>MARKS:100</b>
<b>CREDITS: 4</b>	<b>TOTAL HOURS:60</b>
<b>PRACTICAL</b>	

**COURSE OBJECTIVE:**

To understand the statistical background for machine learning using SAS Viya.

**COURSE OUTCOME:**

1. Understand the relevance of statistics in big data and machine learning
2. Construct linear regression model
3. Understand statistical analysis of data
4. Create decision tree model
5. Demonstrate stratified model fitting

**EXERCISES:**

- Exploring Statistics and Machine Learning
- Explanatory Modeling Using Linear Regression in SAS Viya
- Predictive Modeling Using Logistic Regression in SAS Viya
- Exploring Statistical Foundations of Machine Learning
- Perform statistical analysis of data of any size
- Create segments, or clusters, of input variables
- Perform decision tree modelling
- Perform stratified model fitting
- Compare models
- Generate score code

**Course Materials Required**

SAS Company manual

**Reference Text**

SAS Internal Reference

**PSO – CO mapping**

	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO 1</b>	3	3	2	3	3
<b>CO 2</b>	3	3	3	2	2
<b>CO 3</b>	3	3	3	3	3
<b>CO 4</b>	2	3	3	3	3
<b>CO 5</b>	3	3	2	3	3
<b>Avg.</b>	2.8	3	2.6	2.8	2.8

**PSO-CO-question paper mapping**

<b>CO No:</b>	<b>COURSE OUTCOME</b>	<b>PSOs ADDRESSED</b>	<b>COGNITIVE LEVEL (K1 to K6)</b>
CO1	Understand the relevance of statistics in big data and machine learning	PSO1, PSO2, PSO3, PSO4, PSO5	K1, K2, K3, K4, K5
CO2	Construct linear regression model	PSO1, PSO2, PSO3, PSO4, PSO5	K1, K2, K3, K4, K5
CO3	Understand statistical analysis of data	PSO1, PSO2, PSO3, PSO4, PSO5	K1, K2, K3, K4, K5
CO4	Create decision tree model	PSO1, PSO2, PSO3, PSO4, PSO5	K1, K2, K3, K4, K5, K6
CO5	Demonstrate stratified model fitting	PSO1, PSO2, PSO3, PSO4, PSO5	K1, K2, K3, K4, K5, K6

**K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create**

<b>PROGRAMME: B.Sc. (CS), BCA, B.Sc. (IT), B.Sc. (DA)</b>	<b>BATCH: 2024 -2027</b>
<b>PART: III</b>	<b>COURSE COMPONENT: ALLIED IV</b>
<b>COURSE NAME: OPERATIONS RESEARCH</b>	<b>COURSE CODE:</b>
<b>SEMESTER: IV</b>	<b>MARKS:100</b>
<b>CREDITS: 5</b>	<b>TOTAL HOURS: 90</b>
<b>THEORY AND PROBLEMS</b>	

**COURSE OBJECTIVE:**

On completion of this course student will be able to use the mathematical knowledge in optimal use of resources.

**COURSE OUTCOMES:**

1. Recollect the fundamental ideas of Operations Research.
2. Understand Solution of LPP, Transportation, Assignment, Sequencing and Network Problems.
3. Apply the concepts of graphical representation and different models into practice.
4. Analyze minimization and maximization concepts of different models.
5. Evaluate different models of LPP, Transportation, Assignment, Sequencing and Network problems.

**UNIT I**

**(18 Hours)**

**Linear Programming Problem:** Introduction, Requirements for a Linear Programming Problem, Assumptions in Linear Programming Models, Applications of Linear Programming Method, Areas of Application of Linear Programming, Formulation of Linear Programming Problems. Graphical Method of Solutions, Some exceptional cases  
Chapter 1 & 2.

**UNIT II**

**(18 Hours)**

**Transportation Problem:** Definitions of the Transportation problem, Formulation and Solution of Transportation Models: Basic feasible solution by North West Corner Method, Least Cost Method, Vogel's Approximation Method. without degeneracy. Unbalanced Transportation Problem, Maximization Problem.  
Chapter 7.

**UNIT III**

**(18 Hours)**

**Assignment Problem:** Definition of the Assignment problem, Formulation and Solution of the Assignment models, Unbalanced Assignment Problem, Maximization Problem.  
Chapter 8.

**UNIT IV**

**(18 Hours)**

**Sequencing Problem:** n jobs through two machines, n jobs through three machines, two jobs through m machines, n jobs through m machines.  
Chapter 14.

**UNIT V**

**(18 Hours)**

**Network Analysis:** Introduction, planning, scheduling, control, basic technologies, rules for constructing a project network, network construction, Program Evaluation Review Techniques (PERT), Critical Path Method (CPM). (no crashing).  
Chapter 15

**PRESCRIBED BOOK:**

Resource Management Techniques - Sundaresan, K.S.Ganapathy Subramanian, K.Ganesan, A.R.Publications.

**REFERENCE BOOKS:**

1. Operations Research - Kandiswarup, P.K.Gupta, ManMohan, S.Chand & Sons Education Publications, New Delhi, 12<sup>th</sup> Revised edition.
2. Operations Research Principles and Problems - S. Dharani Venkata Krishnan, Keerthi publishing house PVT Ltd
3. Operations Research - Prem Kumar Gupta & D. S. Hira, 7th Revised Edition, S. Chand & Company Ltd., 2014

**E - LEARNING RESOURCES**

1. <https://nptel.ac.in/courses/110106062> .
2. <https://maa.org/press/maa-reviews/operations-research-problems> .
3. [https://ocw.mit.edu/courses/15-053-optimization-methods-in-management-science-spring-2013/resources/mit15\\_053s13\\_lec2/](https://ocw.mit.edu/courses/15-053-optimization-methods-in-management-science-spring-2013/resources/mit15_053s13_lec2/) .

**GUIDELINES TO THE QUESTION PAPER SETTERS****QUESTION PAPER PATTERN**

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions	1 - 12	3	30
B	Answer any 5 out of 7 questions	13 - 19	6	30
C	Answer any 4 out of 6 questions	20 - 25	10	40
<b>TOTAL MARKS</b>				<b>100</b>

**BREAK UP OF QUESTIONS FOR THEORY**

UNITS	SECTION A	SECTION B	SECTION C
I	2	1	1
II	2	1	1
III	2	1	1
IV	2	1	1
V	2	1	1
Any Unit	2	2	1
<b>TOTAL</b>	<b>12</b>	<b>7</b>	<b>6</b>
<b>SECTION A - 12</b>		<b>SECTION B - 7</b>	<b>SECTION C - 6</b>

### PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	3	2	2	3
CO 2	3	2	2	3	2
CO 3	3	2	3	3	2
CO 4	2	3	2	2	3
CO 5	2	3	3	3	2
Ave.	2.4	2.6	2.4	2.6	2.4

### PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Recollect the fundamental ideas of Operations Research.	1-5	K1
CO2	Understand Solution of LPP, Transportation, Assignment, Sequencing and Network Problems.	1-5	K1,K2
CO3	Apply the concepts of graphical representation and different models into practice.	1-5	K3
CO4	Analyze minimization and maximization concepts of different models	1-5	K3,K4
CO5	Evaluate different models of LPP, Transportation, Assignment, Sequencing and Network Problems.	1-5	K4,K5

**K1=Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create**

<b>PROGRAMME: ALL UG</b>	<b>BATCH: 2024 - 27</b>
<b>PART: IV</b>	<b>COURSE COMPONENT: EVS</b>
<b>COURSE NAME: ENVIRONMENTAL STUDIES</b>	<b>COURSE CODE:</b>
<b>SEMESTER: IV</b>	<b>MARKS:100</b>
<b>CREDITS: 2</b>	<b>TOTAL HOURS: 30</b>
<b>THEORY</b>	

#### **UNIT-1:**

The Multidisciplinary nature of environmental studies Definition; Scope and importance, Need for public awareness.

#### **UNIT-2:**

Natural Resources: Renewable and non-renewable resources: Natural resources and associated problems.

- a) Forest resources: Use and Over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
- b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water dams benefits and problems.
- c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
- d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
- e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, Case studies.
- f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. - Role of an individual in conservation of natural resources. - Equitable use of resources for sustainable lifestyles.

#### **UNIT-3:**

Ecosystems - Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem.

- Ecological succession. - Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of the following ecosystem: -

- a. Forest ecosystem
- b. Grassland ecosystem
- c. Desert ecosystem
- d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

#### **UNIT-4:**

Biodiversity and its Conservation

- Introduction-Definition: genetic, species and ecosystem diversity.
- Biogeographical classification of India.
- Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.
- Biodiversity at global, National and local levels.
- India as a mega-diversity nation.
- Hot-spots of biodiversity.
- Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India.
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

**UNIT-5: Environmental Pollution: Definition - Causes, effects and control measures of: -**

- a. Air pollution
- b. Water pollution
- c. Soil pollution
- d. Marine pollution
- e. Noise pollution
- f. Thermal pollution
- g. Nuclear hazards

- Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution. - Pollution case studies. - Disaster management: floods, earthquake, cyclone and landslides.

**UNIT-6: Social Issues and the Environment**

- From Unsustainable to Sustainable development.
- Urban problems related to energy. - Water conservation, rain water harvesting, watershed management.
- Resettlement and rehabilitation of people; its problems and concerns. Case studies.
- Environmental ethics: Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection Act.
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and Control of Pollution) Act.
- Wildlife Protection Act.
- Forest Conservation Act.
- Issues involved in enforcement of environmental legislation.
- Public awareness.

**UNIT-7: Human Population and the Environment**

- Population growth, variation among nations.
- Population explosion-Family welfare Programme.
- Environment and human health.
- Human Rights.
- Value Education.
- HIV/AIDS.
- Women and Child Welfare.
- Role of information Technology in Environment and human health.
- Case Studies. UNIT-8: Field Work (Practical).
- Visit to a local area to document environmental assets-river/forest/grassland/ hill/mountain.
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural.
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc. SIX MONTHS COMPULSORY CO

**UNIT-8: Field Work (Practical).**

- Visit to a local area to document environmental assets-river/forest/grassland/ hill/mountain.
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural.
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc

# **SEMESTER - V**



<b>PROGRAMME: B.Sc., DATA ANALYTICS</b>	<b>BATCH: 2024 -2027</b>
<b>PART: III</b>	<b>COURSE COMPONENT: CORE – XIII</b>
<b>COURSE NAME: MACHINE LEARNING</b>	<b>COURSE CODE:</b>
<b>SEMESTER: V</b>	<b>MARKS:100</b>
<b>CREDITS: 4</b>	<b>TOTAL HOURS:90</b>
<b>THEORY</b>	

**COURSE OBJECTIVE:**

Machine learning basics is to introduce fundamental concepts and techniques for understanding, implementing, and applying machine learning algorithms

**COURSE OUTCOMES:**

1. Understand the Machine learning types and its main challenges
2. Perform Data cleaning and Data classification
3. Describe Training models
4. Explain Supervised machine learning techniques
5. Learn Unsupervised learning techniques

**UNIT I**

**(18 Hours)**

The Machine Learning Landscape : Introduction - Types of Machine Learning Systems - Supervised/Unsupervised Learning, Batch and Online Learning, Instance- Based Versus Model-Based Learning - Main Challenges of Machine Learning - Non- representative Training Data, Poor-Quality Data - Underfitting the Training Data - Testing and Validating- Frame the Problem - Get the data -Explore and visualize the data to gain Insights- Prepare the Data for Machine Learning Algorithms.

**UNIT II**

**(18 Hours)**

Data Cleaning - Handling Text and Categorical Attributes- Feature Scaling- Transformation Pipelines- Select and Train a Model- Training and Evaluating on the Training Set- Fine-Tune Your Model- Grid Search- Randomized Search. Classification: MNIST- Training a Binary Classifier- Performance Measures- Measuring Accuracy Using Cross-Validation- Confusion Matrix- Precision and Recall – Multiclass, multi-label and multi-output classification.

**UNIT III**

**(18 Hours)**

Training Models: Linear Regression- The Normal Equation- Computational Complexity- Gradient and batch gradient Descent- Stochastic Gradient Descent- Mini- batch Gradient Descent- Polynomial Regression- Learning Curves- Ridge Regression- Lasso Regression- Logistic Regression-Estimating Probabilities- Training and Cost Function- Decision Boundaries.

**UNIT IV**

**(18 Hours)**

Support Vector Machines : Linear SVM classification -Non- Linear SVM Classification -SVM Regression -Decision Trees: Training and Visualizing a Decision Tree- Making Predictions– Ensemble Learning and Random Forests: Voting classifiers – Bagging and Pasting - Random Patches and Random Subspaces – Random Forests – Boosting – Adaboost-Gradient Boosting– Stacking.

**UNIT V**

**(18 Hours)**

Dimensionality Reduction – Main Approaches for Dimensionality Reduction – PCA -Unsupervised Learning Techniques- Clustering - K-Means - Limits of K- Means - Using clustering for image segmentation, Preprocessing, Semi supervised Learning- DBSCAN.

**PRESCRIBED BOOKS:**

1. Hands-on Machine Learning with Scikit-Learn, Keras, and TensorFlow by Aurélien Géron, 2019 Aurélien Géron. Published by O'Reilly Media, Inc.

**REFERENCE BOOKS:**

1. Machine Learning Step-by-Step Guide to Implement Machine Learning Algorithms with Python By Rudolph Russell-Copyright 2018.
2. Introduction to Machine Learning Second Edition by Ethem Alpaydm, MIT Press-Cambridge, Massachusetts-London.

**E-LEARNING RESOURCES:**

1. <https://www.kaggle.com/discussions/general/196686>
2. <https://www.tensorflow.org/resources/learn-ml>
3. [https://www.tutorialspoint.com/machine\\_learning/machine\\_learning\\_implementing.htm](https://www.tutorialspoint.com/machine_learning/machine_learning_implementing.htm)
4. [https://www.tutorialspoint.com/tensorflow/tensorflow\\_machine\\_learning\\_deep\\_learning.htm](https://www.tutorialspoint.com/tensorflow/tensorflow_machine_learning_deep_learning.htm)
5. <https://www.javatpoint.com/types-of-machine-learning>
6. <https://www.geeksforgeeks.org/introduction-machine-learning/>
7. [https://www.w3schools.com/ai/ai\\_linear\\_graphs.asp](https://www.w3schools.com/ai/ai_linear_graphs.asp)

**GUIDELINES TO THE QUESTION PAPER SETTERS QUESTION****PAPER PATTERN**

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
<b>A</b>	<i>Answer any 10 out of 12 questions (each in 50 words)</i>	<i>1-12</i>	<i>3</i>	<i>30</i>
<b>B</b>	<i>Answer any 5 out of 7 questions (each in 300 words)</i>	<i>13-19</i>	<i>6</i>	<i>30</i>
<b>C</b>	<i>Answer any 4 out of 6 questions (each in 1200 words)</i>	<i>20-25</i>	<i>10</i>	<i>40</i>
<b>TOTAL MARKS</b>				<b>100</b>

**BREAK UP OF QUESTIONS**

UNITS	SECTION A	SECTION B	SECTION C
I	2	2	1
II	2	2	1
III	3	1	2
IV	3	1	1
V	2	1	1
<b>TOTAL</b>	<b>12</b>	<b>7</b>	<b>6</b>
<b>SECTION A – 12</b>		<b>SECTION B – 7</b>	<b>SECTION C - 6</b>

**PSO – CO mapping**

	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO 1</b>	3	3	3	2	3
<b>CO 2</b>	3	3	3	3	2
<b>CO 3</b>	3	3	3	2	3
<b>CO 4</b>	3	3	2	3	3
<b>CO 5</b>	3	3	3	2	3
<b>Avg.</b>	3	3	2.8	2.3	2.8

**PSO-CO-question paper mapping**

<b>CO No:</b>	<b>COURSE OUTCOME</b>	<b>PSOs ADDRESSED</b>	<b>COGNITIVE LEVEL (K1 to K6)</b>
CO1	Understand the Machine learning types and its main challenges	PSO1, PSO2,PSO3, PSO4,PSO5	K1,K3,K4
CO2	Perform Data cleaning and Data classification	PSO1, PSO2,PSO3, PSO4,PSO5	K2,K4,K5
CO3	Describe Training models	PSO1, PSO2,PSO3, PSO4,PSO5	K1,K2,K3,K6
CO4	Explain Supervised machine learning techniques	PSO1, PSO2,PSO3, PSO4,PSO5	K2,K4,K5
CO5	Learn Unsupervised learning techniques	PSO1, PSO2,PSO3, PSO4,PSO5	K1,K4,K5, K6

**K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create**

<b>PROGRAMME: B.Sc., DATA ANALYTICS</b>	<b>BATCH: 2024 -2027</b>
<b>PART: III</b>	<b>COURSE COMPONENT: CORE – XIV</b>
<b>COURSE NAME: SOFTWARE ENGINEERING</b>	<b>COURSE CODE:</b>
<b>SEMESTER: V</b>	<b>MARKS:100</b>
<b>CREDITS: 4</b>	<b>TOTAL HOURS:90</b>
<b>THEORY</b>	

**COURSE OBJECTIVE:**

To understand the concepts of software engineering. To study the software testing and evolution.

**COURSE OUTCOME:**

1. Study Professional Software Engineering Practice
2. Understand the concepts of Process Structure
3. Learn Agile Development
4. Describe Design Concepts
5. Understand Software evolution processes

**UNIT I (18 Hours)**

The Nature of Software: Defining Software- Software Application Domains-Legacy Software. Changing Nature of Software: Web Apps, Mobile Applications, Cloud Computing, Product Line Software. Software Process: Process Framework- Process Adaptation. Software Engineering Practice-Software Development Myths.

**UNIT II (18 Hours)**

Process Structure: Generic Process Model-Defining a Framework Activity-Identifying a Task Set-Process Assessment and Improvement. Process Models: The Waterfall Model- Incremental Process Models- Evolutionary Process Models. Specialized Process Models: Component-Based Development-The Formal Methods Model- Aspect-Oriented Software Development.

**UNIT III (18 Hours)**

Agile Development: Agile Process-Agility and the Cost of Change- Agility Principles. Extreme Programming: The XP Process- Industrial XP-Agile Process Models: Scrum-Dynamic Systems Development Method- Agile Modeling. Characteristics of a Software Engineer-Software Team- Team Structures- Agile Teams. Requirements Engineering.

**UNIT IV (18 Hours)**

Design Concepts: Design Process- Software Quality Guidelines and Attributes-Design Concepts-Abstraction-Architecture-Patterns-Modularity-Information Hiding-Functional independence- Refactoring-Object-Oriented, Design Concepts-Design Classes. Architectural Design: Software Architecture-Architectural Descriptions- Component-Level Design: Object-Oriented View.

**UNIT V (18 Hours)**

Software Evolution: Evolution Processes – Legacy Systems - Software Maintenance - Agile Software Quality Assurance: Software Quality Assurance: SQA Processes and Product Characteristics-Statistical Software Quality Assurance-Software Testing: Verification and Validation-Unit Testing- Integration Testing-White-Box Testing- Basis Path Testing-Black-Box Testing-Metrics in the Process and Project Domains

**PRESCRIBED BOOKS:**

1. Software Engineering- A PRACTITIONER'S APPROACH- EIGHTH EDITION Roger S. Pressman, Ph.D. & Bruce R. Maxim, Ph.D.  
McGraw Hill Education -ISBN 978-0-07-802212-8

**REFERENCE BOOKS:**

1. Roger S. Pressman, Software Engineering, 5<sup>th</sup> Edition, McGrawHill, 2001.

**GUIDELINES TO THE QUESTION PAPER SETTERS QUESTION****PAPER PATTERN**

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
<b>A</b>	<i>Answer any 10 out of 12 questions (each in 50 words)</i>	<i>1-12</i>	<i>3</i>	<i>30</i>
<b>B</b>	<i>Answer any 5 out of 7 questions (each in 300 words)</i>	<i>13-19</i>	<i>6</i>	<i>30</i>
<b>C</b>	<i>Answer any 4 out of 6 questions (each in 1200 words)</i>	<i>20-25</i>	<i>10</i>	<i>40</i>
<b>TOTAL MARKS</b>				<b>100</b>

**BREAK UP OF QUESTIONS**

UNITS	SECTION A	SECTION B	SECTION C
I	2	2	1
II	2	2	1
III	3	1	2
IV	3	1	1
V	2	1	1
<b>TOTAL</b>	<b>12</b>	<b>7</b>	<b>6</b>
<b>SECTION A – 12</b>		<b>SECTION B – 7</b>	<b>SECTION C - 6</b>

**PSO – CO mapping**

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
<b>CO 1</b>	3	3	3	2	3
<b>CO 2</b>	3	3	3	3	2
<b>CO 3</b>	3	3	3	2	3
<b>CO 4</b>	3	3	2	3	3
<b>CO 5</b>	3	3	3	2	3
<b>Avg.</b>	3	3	2.8	2.4	2.8

**PSO-CO-question paper mapping**

<b>CO No:</b>	<b>COURSE OUTCOME</b>	<b>PSOs ADDRESSED</b>	<b>COGNITIVE LEVEL (K1 to K6)</b>
CO1	Study Professional Software Engineering Practice	PSO1, PSO2,PSO3, PSO4,PSO5	K1,K3,K4
CO2	Understand the concepts of Process Structure	PSO1, PSO2,PSO3, PSO4,PSO5	K2,K4,K5
CO3	Learn Agile Development	PSO1, PSO2,PSO3, PSO4,PSO5	K1,K2,K3,K6
CO4	Describe Design Concepts	PSO1, PSO2,PSO3, PSO4,PSO5	K2,K4,K5
CO5	Understand Software evolution processes	PSO1, PSO2,PSO3, PSO4,PSO5	K1,K4,K5, K6

**K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create**

<b>PROGRAMME: B.Sc., DATA ANALYTICS</b>	<b>BATCH: 2024 -2027</b>
<b>PART: III</b>	<b>COURSE COMPONENT: CORE – XV</b>
<b>COURSE NAME: PRACTICAL – V - APPLIED MACHINE LEARNING AND FORECASTING</b>	<b>COURSE CODE:</b>
<b>SEMESTER: V</b>	<b>MARKS:100</b>
<b>CREDITS: 4</b>	<b>TOTAL HOURS:90</b>
<b>PRACTICAL</b>	

**COURSE OBJECTIVE:**

To understand the theoretical foundation for techniques associated with supervised machine learning models.

**COURSE OUTCOME:**

1. Examine and prepare data for analytical model development
2. Develop a series of supervised learning models
3. Demonstrate the deployment and management of analytical models under production
4. Interpret the visualization of modeling data using attribute variables
5. Demonstrate the refinement of forecast models

**EXERCISES:**

1. Data Preparation using SAS Model Studio
2. Decision Trees and Ensembles of Trees in SAS Model Studio
3. Neural Networks in SAS Model Studio
4. Additional Topics in SAS Model Studio
5. Data Visualization using SAS Model Studio
6. Pipeline Essentials in SAS Model Studio
7. Hierarchical Forecasting in SAS Model Studio
8. Post-forecasting Functionality in SAS Model Studio
9. Improving Modeling in SAS Model Studio
10. In-Line Code Access in SAS Model Studio

**COURSE MATERIALS**

SAS Company Manual

**REFERENCE TEXT**

SAS Internal Reference

**PSO – CO mapping**

	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO 1</b>	3	3	3	3	3
<b>CO 2</b>	3	2	3	2	2
<b>CO 3</b>	3	3	3	3	3
<b>CO 4</b>	2	3	3	3	3
<b>CO 5</b>	3	3	2	3	3
<b>Avg.</b>	2.8	2.8	2.8	2.8	2.8

**PSO-CO-question paper mapping**

<b>CO No:</b>	<b>COURSE OUTCOME</b>	<b>PSOs ADDRESSED</b>	<b>COGNITIVE LEVEL (K1 to K6)</b>
CO1	Examine and prepare data for analytical model development	PSO1, PSO2, PSO3, PSO4, PSO5	K1, K2, K3, K4, K5
CO2	Develop a series of supervised learning models	PSO1, PSO2, PSO3, PSO4, PSO5	K1, K2, K3, K4, K5
CO3	Demonstrate the deployment and management of analytical models under production	PSO1, PSO2, PSO3, PSO4, PSO5	K1, K2, K3, K4, K5
CO4	Interpret the visualization of modeling data using attribute variables	PSO1, PSO2, PSO3, PSO4, PSO5	K1, K2, K3, K4, K5, K6
CO5	Demonstrate the refinement of forecast models	PSO1, PSO2, PSO3, PSO4, PSO5	K1, K2, K3, K4, K5, K6

**K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create**



<b>PROGRAMME: B.Sc., DATA ANALYTICS</b>	<b>BATCH: 2024 -2027</b>
<b>PART: III</b>	<b>COURSE COMPONENT: ELECTIVE – I</b>
<b>COURSE NAME: CYBER SECURITY</b>	<b>COURSE CODE:</b>
<b>SEMESTER: V</b>	<b>MARKS:100</b>
<b>CREDITS: 5</b>	<b>TOTAL HOURS:90</b>
<b>THEORY</b>	

**COURSE OBJECTIVE:**

To equip students with the knowledge, skills, and abilities needed to understand, prevent, detect, and respond to cybersecurity threats effectively.

**COURSE OUTCOMES:**

1. Understand the basics of Cyber security concepts
2. Elucidate Hackers tracks and Detection techniques
3. Study Exploration and Web exploit tools
4. Demonstrate Malicious code and Spyware
5. Demonstrate about Memory forensics and Memory analysis frameworks

**UNIT I**

**(18 Hours)**

Cyber Security Fundamentals: Network and Security Concepts – Information Assurance Fundamentals – Basic Cryptography – Symmetric Encryption – Public key encryption – DNS –Firewalls – Virtualization –Microsoft windows Security Principles – Windows Tokens – Window Messaging.

**UNIT II**

**(18 Hours)**

Attacker Techniques and Motivations: How Hackers Cover their Tracks – Types of Proxies - Tunneling Techniques – HTTP, ICMP – Detection and Prevention - Fraud Techniques – Phishing, Smishing, Vishing and Mobile Malicious Code - Threat Infrastructure.

**UNIT III**

**(18 Hours)**

Exploitation :Techniques to Gain a Foothold – Shellcode – Integer Overflow Vulnerabilities – Stack Based Buffer Overflows – Format String Vulnerabilities – SQL Injection – Malicious PDF Files – Reducing the Risks of Malicious PDF Files –Race Conditions – DoS Conditions – Brute Force and Dictionary Attacks.

**UNIT IV**

**(18 Hours)**

Malicious Code: Self-Replication Malicious Code - Evading Detection and Elevating Privileges – Persistent Software Techniques – Rootkits – Spyware- Attacks against Privileged User Accounts and Escalation of Privileges – Token Kidnapping – VirtualMachine Detection – Stealing Information and Exploitation: Man-in-the-middle attacks-DLL-Injection.

**UNIT V**

**(18 Hours)**

Defense and Analysis Techniques: Memory Forensics – Why Memory Forensics is Important – Capabilities of Memory Forensics – Memory Analysis Frameworks – Dumping Physical Memory – Installing and Using Volatility – HoneyPots –Automated Malicious Code Analysis system-Intrusion Detection Systems.

**PRESCRIBED BOOKS:**

1. Cyber Security Essentials, James Graham, Richard Howard, Ryan Olson, CRC,2011

**REFERENCE BOOKS:**

1. Cyber Security Fundamentals, Chuck Easttom, Pearson, Second Edition.

## E-LEARNING RESOURCES:

1. <https://www.geeksforgeeks.org/cyber-security-types-and-importance/>
2. <https://www.javatpoint.com/types-of-cyber-attackers>
3. [https://www.tutorialspoint.com/fundamentals\\_of\\_science\\_and\\_technology/cyber\\_crime\\_and\\_cyber\\_security.htm](https://www.tutorialspoint.com/fundamentals_of_science_and_technology/cyber_crime_and_cyber_security.htm)
4. <https://www.w3schools.com/cybersecurity/>
5. [https://www.w3schools.com/cybersecurity/cybersecurity\\_wifi\\_attacks.php](https://www.w3schools.com/cybersecurity/cybersecurity_wifi_attacks.php)

## GUIDELINES TO THE QUESTION PAPER SETTERSQUESTION

### PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions(each in 50 words)	1-12	3	30
B	Answer any 5 out of 7 questions(each in 300 words)	13-19	6	30
C	Answer any 4 out of 6 questions(each in 1200 words)	20-25	10	40
<b>TOTAL MARKS</b>				<b>100</b>

### BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	1	1
II	2	2	1
III	2	2	1
IV	3	1	2
V	2	1	1
<b>TOTAL</b>	12	7	6
<b>SECTION A – 12</b>		<b>SECTION B – 7</b>	<b>SECTION C - 6</b>

### PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	3	2	3	3
CO 2	3	3	3	3	2
CO 3	3	2	3	3	3
CO 4	3	3	2	3	3
CO 5	3	3	3	2	3
Avg.	3	2.8	2.6	2.8	2.8

### PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Understand the basics of Cyber security concepts	PSO1, PSO2, PSO3, PSO4, PSO5	K1,K2,K3,K4
CO2	Elucidate Hackers tracks and Detection techniques	PSO1, PSO2, PSO3, PSO4, PSO5	K1,K2,K4,K5
CO3	Study Exploration and Web exploit tools	PSO1, PSO2, PSO3, PSO4, PSO5	K1,K2,K3,K6
CO4	Demonstrate Malicious code and Spyware	PSO1, PSO2, PSO3, PSO4, PSO5	K2,K4,K5
CO5	Demonstrate about Memory forensics and Memory analysis frameworks	PSO1, PSO2, PSO3, PSO4, PSO5	K1,K4,K5, K6

**K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create**

<b>PROGRAMME: B.Sc., DATA ANALYTICS</b>	<b>BATCH: 2024 -2027</b>
<b>PART: III</b>	<b>COURSE COMPONENT: ELECTIVE – I</b>
<b>COURSE NAME: BUSINESS ANALYTICS</b>	<b>COURSE CODE:</b>
<b>SEMESTER: V</b>	<b>MARKS:100</b>
<b>CREDITS: 5</b>	<b>TOTAL HOURS:90</b>
<b>THEORY</b>	

**COURSE OBJECTIVE:**

To equip students with the necessary knowledge in Business Intelligence using different business intelligence tools.

**COURSE OUTCOMES:**

1. Understand Software models and to explore data.
2. Explore the Relationships Variables.
3. Explain about Probability and Decision making under Uncertainty.
4. Understand Elements of Decision Analysis.
5. Learn Multistage Decision Problems and the Value of Information.

**UNIT I (18 Hours)**

Introduction - The Methods-The Software- Modeling and Models: Graphical Models, Algebraic Models, Spreadsheet Models, A Seven-Step Modeling Process. Exploring Data: Describing the Distribution of a Single Variable: Data Sets, Variables, and Observations, Types of Data.

**UNIT II (18 Hours)**

Descriptive Measures for Categorical and Numerical variables, Charts for Numerical Variables, Time Series Data, Outliers and Missing Values. Finding Relationships among Variables: Relationships among Categorical Variables and a Numerical Variable, Scatterplots.

**UNIT III (18 Hours)**

Correlation and Covariance, Pivot Tables, Probability and Decision making under Uncertainty: Probability Essentials, Rule of Complements-Addition Rule- Conditional Probability and the Multiplication Rule - Probability Distribution of a Single Random Variable.

**UNIT IV (18 Hours)**

Conditional Mean and Variance- Normal, Binomial, Poisson, and Exponential Distributions - Decision Making under Uncertainty- Elements of Decision Analysis-Payoff Tables- Possible Decision Criteria - Expected Monetary Value (EMV).

**UNIT V (18 Hours)**

Decision Trees- The Precision Tree Add-In-Bayes' Rule. Multistage Decision Problems and the Value of Information- Sampling and Sampling Distributions- Sampling Terminology- Methods for Selecting Random Samples- Introduction to Estimation- Confidence Interval Estimation - Hypothesis Testing.

**PRESCRIBED BOOKS:**

1. Business Analytics: Data Analysis and Decision Making, Fifth Edition, S. Christian Albright and Wayne L. Winston Cengage Learning, US.

## REFERENCES BOOKS:

1. Business Analysis For Dummies® Published by: John Wiley & Sons, Inc. 111 River Street Hoboken, NJ 07030-5774, www.wiley.com.

## E-LEARNING RESOURCES:

1. [https://mrcet.com/downloads/digital\\_notes/AE/III/Business%20Analytics.pdf](https://mrcet.com/downloads/digital_notes/AE/III/Business%20Analytics.pdf)
2. <https://www.analyticsvidhya.com/blog/2021/06/exploratory-data-analysis-using-data-visualization-techniques/>
3. [https://www.southampton.ac.uk/~sks/teach/2018\\_math1024.pdf](https://www.southampton.ac.uk/~sks/teach/2018_math1024.pdf)
4. <https://egyankosh.ac.in/bitstream/123456789/89090/1/Block-2.pdf>
5. [https://mrcet.com/downloads/digital\\_notes/CSE/IV%20Year/MACHINE%20LEARNING\(R17A0534\).pdf](https://mrcet.com/downloads/digital_notes/CSE/IV%20Year/MACHINE%20LEARNING(R17A0534).pdf)

## GUIDELINES TO THE QUESTION PAPER SETTERS

### QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions (each in 50 words)	1-12	3	30
B	Answer any 5 out of 7 questions (each in 300 words)	13-19	6	30
C	Answer any 4 out of 6 questions (each in 1200 words)	20-25	10	40
<b>TOTAL MARKS</b>				<b>100</b>

### BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	2	2	1
II	2	2	1
III	3	1	2
IV	3	1	1
V	2	1	1
<b>TOTAL</b>	12	7	6
<b>SECTION A – 12</b>		<b>SECTION B – 7</b>	<b>SECTION C - 6</b>

### PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	3	3	3
CO 2	3	2	3	3	2
CO 3	3	3	3	2	2
CO 4	3	3	3	2	3
CO 5	3	3	3	3	3
Avg.	3	2.8	3	2.6	2.6

### PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Introduce Software models and to explore data	PSO1, PSO2, PSO3, PSO4, PSO5	K1
CO2	Find the Relationships Variables	PSO1, PSO2, PSO3, PSO4, PSO5	K2
CO3	Explain about Probability and Decision making under Uncertainty	PSO1, PSO2, PSO3, PSO4, PSO5	K3
CO4	Understand Elements of Decision Analysis	PSO1, PSO2, PSO3, PSO4, PSO5	K4
CO5	Learn Multistage Decision Problems and the Value of Information	PSO1, PSO2, PSO3, PSO4, PSO5	K5, K6

**K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create**

<b>PROGRAMME: B.Sc., DATA ANALYTICS</b>	<b>BATCH: 2024 -2027</b>
<b>PART: III</b>	<b>COURSE COMPONENT: ELECTIVE – I</b>
<b>COURSE NAME: IoT</b>	<b>COURSE CODE:</b>
<b>SEMESTER: V</b>	<b>MARKS:100</b>
<b>CREDITS: 5</b>	<b>TOTAL HOURS:90</b>
<b>THEORY</b>	

**COURSE OBJECTIVE:**

To understand the concept of Internet of Things.

**COURSE OUTCOME:**

1. Understand about Internet of Things and its design principles
2. Familiarize prototyping and embedded devices
3. Enumerate prototyping the physical design
4. Demonstrate techniques for writing embedded code
5. Understand about manufacturing techniques

**UNIT I:**

**(18 Hours)**

**The Internet of Things: An Overview:** The Flavour of the Internet of Things, The “Internet” of “Things”, The Technology of the Internet of Things, Enchanted Objects, Who is Making the Internet of Things? **Design Principles for Connected Devices:** Calm and Ambient Technology, Magic as Metaphor, Privacy, Keeping Secrets, Whose Data Is It Anyway? WebThinking for Connected Devices, Small Pieces, Loosely Joined, First-Class Citizens On The Internet, Graceful Degradation, Affordances. **Internet Principles:** Internet Communications: An Overview, IP, TCP, The IP Protocol Suite (TCP/IP), UDP, IP Addresses, DNS, Static IP Address Assignment, Dynamic IP Address Assignment, IPv6, MAC Addresses, TCP and UDP Ports, An Example: HTTP Ports, Other Common Ports, Application Layer Protocols, HTTP, **HTTPS: Encrypted HTTP, Other Application Layer Protocols.**

**UNIT II:**

**(18 Hours)**

**Thinking About Prototyping:** Sketching, Familiarity, Costs versus Ease of Prototyping, Prototypes and Production, Changing Embedded Platform, Physical Prototypes and Mass Personalisation, Climbing into the Cloud, Open Source versus Closed Source, Why Closed? Why Open? Mixing Open and Closed Source, Closed Source for Mass Market Projects, Tapping into the Community. **Prototyping Embedded Devices:** Electronics, Sensors, Actuators, Scaling Up the Electronics, Embedded Computing Basics, Microcontrollers, System-on-Chips, Choosing YourPlatform, Arduino, Developing on the Arduino, Some Notes on the Hardware, Openness, RaspberryPi, Cases and Extension Boards, Developing on the Raspberry Pi, Some Notes on the Hardware, Openness.

**UNIT III:**

**(18 Hours)**

**Prototyping the Physical Design:** Preparation, Sketch, Iterate, and Explore, Nondigital Methods, Laser Cutting, Choosing a Laser Cutter, Software, Hinges and Joints, 3D Printing, Types of 3D Printing, Software, CNC Milling, Repurposing/Recycling. **Prototyping Online Components:** Getting Started with an API, Mashing Up APIs, Scraping, Legalities, Writing a New API, Clockodillo, Security, Implementing the API, Using Curl to Test, Going Further, Real-Time Reactions, Polling, Comet, Other Protocols, MQ Telemetry Transport, Extensible Messaging and Presence Protocol, Constrained Application Protocol.

**UNIT IV:****(18 Hours)**

**Techniques for Writing Embedded Code:** Memory Management, Types of Memory, Making the Most of Your RAM, Performance and Battery Life, Libraries, Debugging **Business Models:** A Short History of Business Models, Space and Time, From Craft to Mass Production, The Long Tail of the Internet, Learning from History, The Business Model Canvas, Who Is the Business Model For? Models, Make Thing, Sell Thing, Subscriptions, Customisation, Be a Key Resource, Provide Infrastructure: Sensor Networks, Take a Percentage, Funding an Internet of Things Startup, Hobby Projects and Open Source, Venture Capital, Government Funding, Crowdfunding, Lean Startups.

**UNIT V:****(18 Hours)**

**Moving to Manufacture:** What Are You Producing? Designing Kits, Designing Printed circuit boards, Software Choices, The Design Process, Manufacturing Printed Circuit Boards, Etching Boards, Milling Boards. Assembly, Testing, Mass-Producing the Case and Other Fixtures, Certification, Costs, Scaling Up Software, Deployment, Correctness and Maintainability, Security, Performance, User Community. **Ethics:** Characterizing the Internet of Things, Privacy, Control, Disrupting Control, Crowdsourcing, Environment, Physical Thing, Electronics, Internet Service, Solutions, The Internet of Things as Part of the Solution, Cautious Optimism, The Open Internet of Things Definition.

**PRESCRIBED BOOKS:**

1. Adrian McEwen, Hakim Cassimally, Designing the Internet of Things, WILEY First Edition 2014
2. Raj Kamal, Internet of Things – Architecture and Design, McGraw Hill, 1<sup>st</sup> Edition, 2017

**REFERENCE BOOKS:**

1. Cuno Pfister, Getting Started with the Internet of Things, O'Reilly, 6th Edition, 2018

**GUIDELINES TO THE QUESTION PAPER SETTERS****QUESTION PAPER PATTERN**

<b>SECTION</b>	<b>QUESTION COMPONENT</b>	<b>NUMBERS</b>	<b>MARKS</b>	<b>TOTAL</b>
<b>A</b>	<i>Answer any 10 out of 12 questions (each in 50 words)</i>	<i>1-12</i>	<i>3</i>	<i>30</i>
<b>B</b>	<i>Answer any 5 out of 7 questions (each in 300 words)</i>	<i>13-19</i>	<i>6</i>	<i>30</i>
<b>C</b>	<i>Answer any 4 out of 6 questions (each in 1200 words)</i>	<i>20-25</i>	<i>10</i>	<i>40</i>
<b>TOTAL MARKS</b>				<b>100</b>



## BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	2	2	1
II	2	2	1
III	3	1	2
IV	3	1	1
V	2	1	1
<b>TOTAL</b>	12	7	6
<b>SECTION A – 12</b>		<b>SECTION B – 7</b>	<b>SECTION C - 6</b>

## PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	3	3	3
CO 2	3	2	3	3	2
CO 3	3	3	3	2	2
CO 4	3	3	3	2	3
CO 5	3	3	3	3	3
Avg.	3	2.8	3	2.6	2.6

## PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Understand about Internet of Things and its design principles	PSO1, PSO2, PSO3, PSO4, PSO5	K1
CO2	Familiarize prototyping and embedded devices	PSO1, PSO2, PSO3, PSO4, PSO5	K2
CO3	Enumerate prototyping the physical design	PSO1, PSO2, PSO3, PSO4, PSO5	K3
CO4	Demonstrate techniques for writing embedded code	PSO1, PSO2, PSO3, PSO4, PSO5	K4
CO5	Understand about manufacturing techniques	PSO1, PSO2, PSO3, PSO4, PSO5	K5, K6

**K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create**

<b>PROGRAMME: B.Sc., DATA ANALYTICS</b>	<b>BATCH: 2024 -2027</b>
<b>PART: III</b>	<b>COURSE COMPONENT: ELECTIVE – II</b>
<b>COURSE NAME: CLOUD COMPUTING</b>	<b>COURSE CODE:</b>
<b>SEMESTER: V</b>	<b>MARKS:100</b>
<b>CREDITS: 5</b>	<b>TOTAL HOURS:75</b>
<b>THEORY</b>	

**COURSE OBJECTIVE:**

To equip students with the necessary knowledge in Amazon Cloud Platform.

**COURSE OUTCOMES:**

1. Learn Amazon Web Services (AWS) Cloud Computing
2. Create an AWS Account
3. Understand the concept of EC2 Virtual machine
4. Design own Infrastructure
5. Deploy a simple Web application with AWS Elastic Beanstalk

**UNIT I**

**(15 Hours)**

Amazon Web Services-Cloud Computing- Hosting a web shop-Implementing a highly available system-Innovative and fast-growing platform- Services solve common problems-Enabling Automation -Flexible capacity (scalability)- Built for failure (reliability) - Reducing time to market.

**UNIT II**

**(15 Hours)**

Global Infrastructure. Free Tier-Pay-per-use opportunities. Creating an AWS Account-Signing In-Creating a key pair-Create a billing alarm to keep track of your AWS bill- simple example: WordPress-Creating and exploring your infrastructure.

**UNIT III**

**(15 Hours)**

Resource Groups-Load balancer-MySQL database- Network file System. Using virtual machines: EC2 - Monitoring and debugging a virtual machine-Changing the size of a virtual machine- Starting a virtual machine in another data center

**UNIT IV**

**(15 Hours)**

Programming your infrastructure - Infrastructure as Code- Installing and configuring the CLI- Controlling virtual machines with SDK. Creating a virtual machine and run a deployment script on startup with AWS Cloud Formation.

**UNIT V**

**(15 Hours)**

Deploying a simple web application with AWS Elastic Beanstalk- Components of AWS Elastic Beanstalk- Securing your system: IAM, security groups, and VPC- Securing your AWS account.

**PRESCRIBED BOOKS:**

1. Amazon Web Services in Action, Second Edition, MICHAEL WITTIG ANDREAS WITTIG FOREWORD BY BEN WHALEY MANNING©2019 by Manning Publications.

**REFERENCES BOOKS:**

1. Beginning Serverless Computing Developing with Amazon Web Services, Microsoft Azure, and Google Cloud Copyright © 2018 by Maddie StiglerAPress.
2. Amazon Web Services™ For Dummies® Published by: John Wiley & Sons, Inc., 2013, New Jersey.

**E-LEARNING RESOURCES:**

1. Free Cloud Computing Services - AWS Free Tier (amazon.com)
2. <https://docs.aws.amazon.com/accounts/latest/reference/welcome-first-time-user.html>
3. <https://docs.aws.amazon.com/accounts/latest/reference/using-orgs.html>
4. <https://docs.aws.amazon.com/elasticloadbalancing/latest/network/create-network-load-balancer.htm>
5. <https://docs.aws.amazon.com/elasticbeanstalk/latest/dg/GettingStarted.CreateApp.htm>

**GUIDELINES TO THE QUESTION PAPER SETTERS****QUESTION PAPER PATTERN**

<b>SECTION</b>	<b>QUESTION COMPONENT</b>	<b>NUMBERS</b>	<b>MARKS</b>	<b>TOTAL</b>
<b>A</b>	<i>Answer any 10 out of 12 questions (each in 50 words)</i>	<i>1-12</i>	<i>3</i>	<i>30</i>
<b>B</b>	<i>Answer any 5 out of 7 questions (each in 300 words)</i>	<i>13-19</i>	<i>6</i>	<i>30</i>
<b>C</b>	<i>Answer any 4 out of 6 questions (each in 1200 words)</i>	<i>20-25</i>	<i>10</i>	<i>40</i>
<b>TOTAL MARKS</b>				<b>100</b>

### BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	2	2
II	3	2	1
III	2	1	1
IV	2	1	1
V	2	1	1
<b>TOTAL</b>	12	7	6
<b>SECTION A – 12</b>		<b>SECTION B - 7</b>	<b>SECTION C - 6</b>

### PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	3	3	3
CO 2	3	2	3	3	2
CO 3	3	3	3	2	2
CO 4	3	3	3	2	3
CO 5	3	3	3	3	3
Avg.	3	2.8	3	2.6	2.6

**PSO-CO-question paper mapping**

<b>CO No:</b>	<b>COURSE OUTCOME</b>	<b>PSOs ADDRESSED</b>	<b>COGNITIVE LEVEL (K1 to K6)</b>
CO1	Learn Amazon Web Services (AWS) Cloud Computing	PSO 1 TO PSO 5	K1
CO2	Create an AWS Account	PSO 1 TO PSO 5	K2
CO3	Understand the concept of EC2 Virtual machine	PSO 1 TO PSO 5	K3
CO4	Design own Infrastructure	PSO 1 TO PSO 5	K4
CO5	Deploy a simple Web application with AWS Elastic Beanstalk	PSO 1 TO PSO 5	K5, K6

**K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create**

<b>PROGRAMME: B.Sc., DATA ANALYTICS</b>	<b>BATCH: 2024 -2027</b>
<b>PART: III</b>	<b>COURSE COMPONENT: ELECTIVE – II</b>
<b>COURSE NAME: DEEP LEARNING</b>	<b>COURSE CODE:</b>
<b>SEMESTER: V</b>	<b>MARKS:100</b>
<b>CREDITS: 5</b>	<b>TOTAL HOURS:75</b>
<b>THEORY</b>	

**COURSE OBJECTIVE:**

To understand the concepts of Deep Learning.

**COURSE OUTCOME:**

1. Understand the concepts about neural network
2. Implement neural networks
3. Familiarize about embedding and representation
4. Implement a part-of-speech tagger
5. Understand memory augmented neural networks

**UNIT I (15 Hours)**

The Neural Network- Building Intelligent Machines – The Limits of Traditional Computer Programs – The Mechanics of Machine Learning – The Neuron – Expression Linear Perceptrons as Neurons – Feed-Forward Neural Networks – Linear Neurons and their Limitations – Training Feed-Forward Neural Networks – The Fast-Food Problem – The Test sets, Validation sets and Overfitting.

**UNIT II (15 Hours)**

Implementing Neural Networks in TensorFlow – What is TensorFlow – How Does TensorFlow Compare to Alternatives? – Creating and manipulating TensorFlow Variables – TensorFlow Operations – Beyond Gradient Descent – The Challenges with Gradient Descent – Model Identifiability – Flat Regions in the Error Surface.

**UNIT III (15 Hours)**

Embedding and Representation Learning – Learning Lower-Dimensional Representations – Principal Component Analysis – Motivating the Autoencoder in TensorFlow – Sparsity in Autoencoders – Implementing the Skip-Gram Architecture – Models for Sequence Analysis – Analyzing Variable-Length Inputs.

**UNIT IV (15 Hours)**

Implementing a Part-of-Speech Tagger – Dependency Parsing and SyntaxNet – Beam Search and Global Normalization – Recurrent Neural Networks – The Challenges with Vanishing Gradients – TensorFlow Primitives for RNN Models – Implementing a Sentiment Analysis Model – Solving Seq2seq Tasks with Recurrent Neural Networks.

**UNIT V (15 Hours)**

Memory Augmented Neural Networks – Neural Turing Machines – Attention –Based Memory Access – NTM Memory Addressing Mechanisms – Differentiable Neural Computers – DNC memory reuse – Temporal Linking of DNC Writes – The DNC Controller Network – Visualizing the DNC in Action – Implementing the DNC in TensorFlow.

**PRESCRIBED BOOKS:**

1. Fundamentals of Deep Learning, Designing Next-Generation Machine Intelligence Algorithms, byNikhil Buduma and Nicholas Lacascio, 2017 Published by O'Reilly Media, Inc.,

**REFERENCE BOOKS:**

1. Bengio, Yoshua, Ian Goodfellow, Aaron Courville, Deep learning, MIT press, 2016.
2. Raúl Rojas, Neural Networks: A Systematic Introduction, 1996, 2nd edition

**GUIDELINES TO THE QUESTION PAPER SETTERS****QUESTION PAPER PATTERN**

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
<b>A</b>	<i>Answer any 10 out of 12 questions (each in 50 words)</i>	<i>1-12</i>	<i>3</i>	<i>30</i>
<b>B</b>	<i>Answer any 5 out of 7 questions (each in 300 words)</i>	<i>13-19</i>	<i>6</i>	<i>30</i>
<b>C</b>	<i>Answer any 4 out of 6 questions (each in 1200 words)</i>	<i>20-25</i>	<i>10</i>	<i>40</i>
<b>TOTAL MARKS</b>				<b>100</b>

**BREAK UP OF QUESTIONS**

UNITS	SECTION A	SECTION B	SECTION C
I	2	2	1
II	2	2	1
III	3	1	2
IV	3	1	1
V	2	1	1
<b>TOTAL</b>	12	7	6
<b>SECTION A – 12</b>		<b>SECTION B – 7</b>	<b>SECTION C - 6</b>

### PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	3	3	3
CO 2	3	2	3	3	2
CO 3	3	3	3	2	2
CO 4	3	3	3	2	3
CO 5	3	3	3	3	3
Avg.	3	2.8	3	2.6	2.6

### PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Understand the concepts about neural network	PSO1, PSO2, PSO3, PSO4, PSO5	K1
CO2	Implement neural networks	PSO1, PSO2, PSO3, PSO4, PSO5	K2
CO3	Familiarize about embedding and representation	PSO1, PSO2, PSO3, PSO4, PSO5	K3
CO4	Implement a part-of-speech tagger	PSO1, PSO2, PSO3, PSO4, PSO5	K4
CO5	Understand memory augmented neural networks	PSO1, PSO2, PSO3, PSO4, PSO5	K5, K6

**K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create**



<b>PROGRAMME: B.Sc., DATA ANALYTICS</b>	<b>BATCH: 2024 -2027</b>
<b>PART: III</b>	<b>COURSE COMPONENT: ELECTIVE – II</b>
<b>COURSE NAME: INFORMATION SECURITY</b>	<b>COURSE CODE:</b>
<b>SEMESTER: V</b>	<b>MARKS:100</b>
<b>CREDITS: 5</b>	<b>TOTAL HOURS:75</b>
<b>THEORY</b>	

**COURSE OBJECTIVE:**

To learn the fundamentals of cryptography and its application to network security and to understand network security threats, security services, and countermeasures.

**COURSE OUTCOMES:**

1. Understand and explain the risks faced by computer systems and networks.
2. Identify and analyze security problems in computer systems and networks.
3. Explain how standard security mechanisms work.
4. Develop security mechanisms to protect computer systems and networks.
5. Use cryptography algorithms and protocols to achieve computer security.

**UNIT I**

**(15 HOURS)**

Introduction to Information Security: Attacks, Vulnerability, Security Goals, Security Services and mechanisms, Conventional Cryptographic Techniques: Conventional substitution and transposition ciphers, One-time Pad.

**UNIT II**

**(15 HOURS)**

Block cipher and Stream Cipher, Steganography, Symmetric and Asymmetric Cryptographic Techniques: DES, AES, RSA algorithms.

**UNIT III**

**(15 HOURS)**

Authentication and Digital Signatures: Use of Cryptography for authentication, Secure Hash function, Key management – Kerberos

**UNIT IV**

**(15 HOURS)**

Program Security: Nonmalicious Program errors – Buffer overflow, Incomplete mediation, Time-of-check to Time-of-use Errors, Viruses, Trapdoors, Salami attack, Man-in-the-middle attacks, Covert channels.

**UNIT V**

**(15 HOURS)**

Security in Networks: Threats in networks, Network Security Controls – Architecture, Encryption, Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honeypots, Traffic flow security, Firewalls – Design and Types of Firewalls, Personal Firewalls, IDS, Email Security – PGP,S/MIME.

**PRESCRIBED BOOKS:**

1. Elaine Rich, Kevin Knight, & Shivashankar B Nair, Artificial Intelligence, McGraw Hill, 3<sup>rd</sup> ed.,2009 (upto chapter 17 excluding 8<sup>th</sup> and 16<sup>th</sup> chapter)

**REFERENCE BOOKS:**

1. Introduction to Artificial Intelligence & Expert Systems, Dan W Patterson, PHI.,2010
2. S Kaushik, Artificial Intelligence, Cengage Learning, 1st ed.2011

**E-LEARNING RESOURCES:**

- NPTEL & MOOC courses titled Artificial Intelligence and Expert Systems
- <https://nptel.ac.in/courses/106106140/>
- <https://nptel.ac.in/courses/106106126/>

**GUIDELINES TO THE QUESTION PAPER SETTERS QUESTION****PAPER PATTERN**

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions(each in 50 words)	1-12	3	30
B	Answer any 5 out of 7 questions(each in 300 words)	13-19	6	30
C	Answer any 4 out of 6 questions(each in 1200 words)	20-25	10	40
<b>TOTAL MARKS</b>				<b>100</b>

**BREAK UP OF QUESTIONS**

UNITS	SECTION A	SECTION B	SECTION C
I	2	2	1
II	2	2	1
III	3	1	2
IV	3	1	1
V	2	1	1
<b>TOTAL</b>	12	7	6
<b>SECTION A – 12</b>		<b>SECTION B – 7</b>	<b>SECTION C - 6</b>

**PSO – CO mapping**

	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO 1</b>	3	3	2	3	3
<b>CO 2</b>	3	3	3	2	2
<b>CO 3</b>	3	2	3	3	3
<b>CO 4</b>	2	3	3	2	3
<b>CO 5</b>	3	3	3	2	3
<b>Avg.</b>	2.8	2.8	2.8	2.4	2.8

**PSO-CO-question paper mapping**

<b>CO No:</b>	<b>COURSE OUTCOME</b>	<b>PSOs ADDRESSED</b>	<b>COGNITIVE LEVEL (K1 to K6)</b>
CO1	Understand and explain the risks faced by computer systems and networks.	PSO1, PSO2, PSO3, PSO4, PSO5	K1
CO2	Identify and analyze security problems in computer systems and networks.	PSO1, PSO2, PSO3, PSO4, PSO5	K2
CO3	Explain how standard security mechanisms work.	PSO1, PSO2, PSO3, PSO4, PSO5	K3
CO4	Develop security mechanisms to protect computer systems and networks.	PSO1, PSO2, PSO3, PSO4, PSO5	K4
CO5	Use cryptography algorithms and protocols to achieve computer security.	PSO1, PSO2, PSO3, PSO4, PSO5	K5, K6

**K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create**

<b>PROGRAMME: ALL UG</b>	<b>BATCH: 2024 - 27</b>
<b>PART: IV</b>	<b>COURSE COMPONENT: VALUE EDUCATION</b>
<b>COURSE NAME: VALUE EDUCATION</b>	<b>COURSE CODE:</b>
<b>SEMESTER: V</b>	<b>MARKS:100</b>
<b>CREDITS: 2</b>	<b>TOTAL HOURS: 30</b>
<b>THEORY</b>	

### **UNIT 1: EDUCATION AND VALUES**

Definition, Concept, Classification, Theory, Criteria and Sources of values Aims and objectives of value education  
 Role and Need for value education in the contemporary society, Role of education in transformation of values in society  
 Role of parents, teachers, society, peer group and mass media in fostering values

### **UNIT 2: VALUE EDUCATION AND PERSONAL DEVELOPMENT**

Human Values: Truthfulness, Sacrifice, Sincerity, Self-Control, Altruism, Scientific Vision, relevancy of human values to good life. Character Formation towards Positive Personality

Modern challenges of adolescents: emotions and behavior Self-analysis and introspection: sensitization towards gender equality, differently abled, Respect for - age, experience, maturity, family members, neighbors, strangers, etc.

### **UNIT 3: HUMAN RIGHTS AND MARGINALIZED PEOPLE**

Concept of Human Rights – Principles of human rights – human rights and Indian constitution – Rights of Women and children – violence against women – Rights of marginalized People – like women, children, minorities, transgender, differently abled etc.

Social Issues and Communal Harmony Social issues – causes and magnitude - alcoholism, drug addiction, poverty, unemployment – communal harmony –concept –religion and its place in public domain –secular civil society

### **UNIT 4: VALUE EDUCATION TOWARDS NATIONAL AND GLOBAL DEVELOPMENT**

Constitutional Values :( Sovereign, Democracy, Socialism, Secularism, Equality, Justice, Liberty, Freedom, Fraternity)

Social Values: (Pity and Probity, Self-Control, Universal Brotherhood).

Professional Values :( Knowledge Thirst, Sincerity in Profession, Regularity, Punctuality, Faith).

Religious and Moral Values: (Tolerance, Wisdom, character).

Aesthetic Values: (Love and Appreciation of literature, fine arts)

Environmental Ethical Values

National Integration and international understanding.

Need of Humanistic value for espousing peace in society. Conflict of cross-cultural influences, cross-border education

## **UNIT 5:**

Guru Nanak Devji's Teachings

Relevance of Guru Nanak Devji's teachings' relevance to Modern Society

The Guru Granth sahib

The five Ks

Values and beliefs

Rights and freedom (Right of equality, Right to Education, Right to Justice, Rights of women, Freedom of religion, Freedom of culture, Freedom of assembly, Freedom of speech)

Empowerment of women

Concept of Langar

Eminent Sikh personalities

### **REFERENCES BOOKS:**

1. Dr.AbdulKalam. My Journey-Transforming Dreams into Actions. Rupa Publications, 2013.
2. Steven R Covey, 8<sup>th</sup> Habit of Effective People (From Effectiveness to Greatness), Free Press, NewYork, 2005.
3. Prem Singh, G.J. (2004). 'Towards Value Based Education', University News. Vol. 42 (45): P.11-12.
4. V.R. Krishna Iyer. Dialectics & Dynamics of Human Rights in India (Tagore Law Lectures) The Yesterday, Today and Tomorrow, Eastern Law House (1999, Reprint 2018)
5. <http://www.ncert.nic.in/rightside/links/pdf/framework/english/nf2005.pdf>

# **SEMESTER - VI**

<b>PROGRAMME: B.Sc., DATA ANALYTICS</b>	<b>BATCH: 2024 -2027</b>
<b>PART: III</b>	<b>COURSE COMPONENT: CORE – XVI</b>
<b>COURSE NAME: WEB DESIGN AND DEVELOPMENT</b>	<b>COURSE CODE:</b>
<b>SEMESTER: VI</b>	<b>MARKS:100</b>
<b>CREDITS: 4</b>	<b>TOTAL HOURS:90</b>
<b>THEORY</b>	

**COURSE OBJECTIVE:**

To equip students with the skills and knowledge to create responsive, visually appealing, and functional websites using industry-standard technologies and best practices.

**COURSE OUTCOMES:**

1. Acquire the basics of Web designing
2. Understand the concepts of cascading style sheets
3. Demonstrate colors and backgrounds
4. Explain Java Scripts and its anatomy
5. Describe the basics of PHP and its scripts

**UNIT I**

**(18 Hours)**

Getting started in web design – Gearing up for web design – The Internet Versus the Web –Serving up your Information – The Anatomy of a Web Page – A Multitude of Devices – Sticking with the Standards – Progressive Enhancement – The Need for speed.

**UNIT II**

**(18 Hours)**

CSS for presentation – Introducing Cascading Style Sheets – The benefits of CSS – How Style Sheets Work – The Big Concepts – CSS units of measurement – Moving Forward with CSS - Formatting Text – Basic Font Properties – Advanced Typography with CSS3 – Changing Text Color –A Few More Selector Types – Text Line Adjustments

**UNIT III**

**(18 Hours)**

Colors and Backgrounds – Specifying Color Values – Foreground Color – Background Color – Clipping the Background – Background Images – Thinking inside the Box – Specifying Box Dimensions – Padding – Borders - Margins – Floating and Positioning – Normal Flow – Floating – Fancy text wrap with CSS Shapes.

**UNIT IV**

**(18 Hours)**

**JavaScript:** What is JavaScript, Adding JavaScript to a page, The Anatomy of a Script, The Browser Object – Events – Putting it all together – Learning more about JavaScript – Using JavaScript – Meet the DOM – Polyfills – JavaScript Libraries – Big Finish.

**UNIT V**

**(18 Hours)**

**PHP** – The Basics – Examining the Structure of a PHP Script – Looking at PHP Syntax –Writing PHP Code – Displaying Content in a Webpage – Using PHP Variables – Using PHP Constants – Understanding Data Types – Using Arrays – Using Dates and Times – Understanding PHP Error Messages.

**PRESCRIBED BOOKS:**

1. Learning Web Design, A Beginner's Guide to HTML, CSS, JavaScript and Web graphics, Jennifer Niederst Robbins, Fifth Edition, O'Reilly Pub., 2018. (UNIT I-IV)

2. PHP, MySQL, JavaScript & HTML All-in-one for Dummies, Steven Suehring, Janet Valade, John Wiley & Sons publication, 2013. (UNIT V)

**REFERENCE BOOKS:**

1. Laura Lemay, Rafe Colburn, Jennifer Kyrnin, "Mastering HTML, CSS & Javascript Web Publishing", 2016.

**E-LEARNING RESOURCES:**

1. <https://www.javatpoint.com/html-tags>
2. <https://www.javatpoint.com/html-vs-xhtml>
3. [https://www.tutorialspoint.com/css/what\\_is\\_css.htm](https://www.tutorialspoint.com/css/what_is_css.htm)
4. <https://www.geeksforgeeks.org/javascript/>
5. [https://www.w3schools.com/js/js\\_string\\_methods.asp](https://www.w3schools.com/js/js_string_methods.asp)

**GUIDELINES TO THE QUESTION PAPER SETTERS QUESTION****PAPER PATTERN**

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
<b>A</b>	Answer any 10 out of 12 questions (each in 50 words)	1-12	3	30
<b>B</b>	Answer any 5 out of 7 questions (each in 300 words)	13-19	6	30
<b>C</b>	Answer any 4 out of 6 questions (each in 1200 words)	20-25	10	40
<b>TOTAL MARKS</b>				<b>100</b>

**BREAK UP OF QUESTIONS**

UNITS	SECTION A	SECTION B	SECTION C
I	2	1	1
II	2	2	1
III	2	1	1
IV	3	2	1
V	3	1	2
<b>TOTAL</b>	12	7	6
<b>SECTION A – 12</b>		<b>SECTION B – 7</b>	<b>SECTION C - 6</b>



### PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
<b>CO 1</b>	3	2	3	3	3
<b>CO 2</b>	3	3	3	2	3
<b>CO 3</b>	3	3	3	2	3
<b>CO 4</b>	3	3	3	3	3
<b>CO 5</b>	3	3	3	2	3
<b>Avg.</b>	3	2.8	3	2.4	3

### PSO-CO-question paper mapping

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Acquire the basics of Web designing	PSO1, PSO2, PSO3, PSO4, PSO5	K1,K2,K3,K4,K5,K6
CO2	Understand the concepts of cascading style sheets	PSO1, PSO2, PSO3, PSO4, PSO5	K1,K2,K3,K4,K5,K6
CO3	Demonstrate colors and backgrounds	PSO1, PSO2, PSO3, PSO4, PSO5	K1,K2,K3,K4,K5,K6
CO4	Explain Java Scripts and its anatomy	PSO1, PSO2, PSO3, PSO4, PSO5	K1,K2,K3,K4,K5,K6
CO5	Describe the basics of PHP and its scripts	PSO1, PSO2, PSO3, PSO4, PSO5	K1,K2,K3,K4,K5,K6

**K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create**

<b>PROGRAMME: B.Sc., DATA ANALYTICS</b>	<b>BATCH: 2024 -2027</b>
<b>PART: III</b>	<b>COURSE COMPONENT: CORE – XVII</b>
<b>COURSE NAME: ARTIFICIAL INTELLIGENCE</b>	<b>COURSE CODE:</b>
<b>SEMESTER: VI</b>	<b>MARKS:100</b>
<b>CREDITS: 4</b>	<b>TOTAL HOURS:90</b>
<b>THEORY</b>	

**COURSE OBJECTIVE:**

To Acquire Knowledge on various AI Techniques and to have enriched knowledge regarding heuristic search, Knowledge representation

**COURSE OUTCOMES:**

1. Gain a working knowledge of the foundations of and modern applications in, artificial intelligence heuristic search, knowledge representation and logic.
2. Use appropriate search algorithms for any AI problem.
3. Represent a problem using first order and predicate logic.
4. Design software agents to solve a problem.
5. Design applications for NLP that use Artificial Intelligence.

**UNIT I**

**(18 HOURS)**

What is Artificial Intelligence? AI Technique, Level of the Model, Problem Spaces, and Search: Defining the Problem as a State Space Search, Production Systems, Problem Characteristics, Production System Characteristics, Issues in the Design of Search Programs.

**UNIT II**

**(18 HOURS)**

Heuristic Search Techniques: Generate-and- Test, Hill Climbing, Best-first Search, Problem Reduction, Constraint Satisfaction, Means-ends Analysis, Knowledge Representation: Representations and Mappings, Approaches to Knowledge Representation - Using Predicate Logic: Representing Simple Facts in Logic, Representing Instance and ISA Relationships, Computable Functions and Predicates, Resolution, Natural Deduction.

**UNIT III**

**(18 HOURS)**

Representing knowledge using Rules: Procedural Versus Declarative Knowledge, Logic Programming, Forward Versus Backward Reasoning, Matching, Control Knowledge. Symbolic Reasoning Under Uncertainty: Introduction to Nonmonotonic Reasoning, Logics for Nonmonotonic Reasoning, Implementation Issues, Augmenting a Problem-solver, Depth-first Search, Breadthfirst Search. Weak slot and filter structures: Semantic Nets, Frames, strong slot and filter structures : Conceptual Dependency Scripts, CYC.

**UNIT IV**

**(18 HOURS)**

Game Playing: The Minimax Search Procedure, Adding Alpha-beta Cutoffs, Iterative Deepening. Planning: The Blocks World, Components of a Planning System, Goal Stack Planning, Nonlinear Planning Using Constraint Posting, Hierarchical Planning Other Planning Techniques. Understanding: What is Understanding, What Makes Understanding Hard?, Understanding as Constraint Satisfaction.

**UNIT V**

**(18 HOURS)**

Natural Language Processing: Introduction, Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing, Statistical Natural Language Processing, Spell Checking. Learning: Rote Learning, learning by Taking Advice, Learning in Problem-solving, Learning from Examples: Induction, Explanation-based Learning, Discovery, Analogy, Formal Learning Theory, Neural Net Learning and Genetic Learning.

**PRESCRIBED BOOKS:**

1. Elaine Rich, Kevin Knight, & Shivashankar B Nair, Artificial Intelligence, McGraw Hill, 3<sup>rd</sup> ed.,2009 (upto chapter 17 excluding 8<sup>th</sup> and 16<sup>th</sup> chapter)

**REFERENCE BOOKS:**

1. Introduction to Artificial Intelligence & Expert Systems, Dan W Patterson, PHI.,2010
2. S Kaushik, Artificial Intelligence, Cengage Learning, 1st ed.2011

**E-LEARNING RESOURCES:**

- NPTEL & MOOC courses titled Artificial Intelligence and Expert Systems
- <https://nptel.ac.in/courses/106106140/>
- <https://nptel.ac.in/courses/106106126/>

**GUIDELINES TO THE QUESTION PAPER SETTERS QUESTION PAPER****PATTERN**

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
<b>A</b>	<i>Answer any 10 out of 12 questions(each in 50 words)</i>	<i>1-12</i>	<i>3</i>	<i>30</i>
<b>B</b>	<i>Answer any 5 out of 7 questions(each in 300 words)</i>	<i>13-19</i>	<i>6</i>	<i>30</i>
<b>C</b>	<i>Answer any 4 out of 6 questions(each in 1200 words)</i>	<i>20-25</i>	<i>10</i>	<i>40</i>
<b>TOTAL MARKS</b>				<b>100</b>

**BREAK UP OF QUESTIONS**

UNITS	SECTION A	SECTION B	SECTION C
I	2	2	1
II	2	2	1
III	3	1	2
IV	3	1	1
V	2	1	1
<b>TOTAL</b>	12	7	6
<b>SECTION A – 12</b>		<b>SECTION B – 7</b>	<b>SECTION C - 6</b>

**PSO – CO mapping**

	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO 1</b>	3	3	2	3	3
<b>CO 2</b>	3	3	3	2	2
<b>CO 3</b>	3	2	3	3	3
<b>CO 4</b>	2	3	3	2	3
<b>CO 5</b>	3	3	3	2	3
<b>Avg.</b>	2.8	2.8	2.8	2.4	2.8

**PSO-CO-question paper mapping**

<b>CO No:</b>	<b>COURSE OUTCOME</b>	<b>PSOs ADDRESSED</b>	<b>COGNITIVE LEVEL (K1 to K6)</b>
CO1	Gain a working knowledge of the foundations of and modern applications in, artificial intelligence heuristic search, knowledge representation and logic.	PSO1, PSO2, PSO3, PSO4, PSO5	K1
CO2	Use appropriate search algorithms for any AI problem	PSO1, PSO2, PSO3, PSO4, PSO5	K2
CO3	Represent a problem using first order and predicate logic	PSO1, PSO2, PSO3, PSO4, PSO5	K3
CO4	Design software agents to solve a problem	PSO1, PSO2, PSO3, PSO4, PSO5	K4
CO5	Design applications for NLP that use Artificial Intelligence.	PSO1, PSO2, PSO3, PSO4, PSO5	K5, K6

**K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create**

<b>PROGRAMME: B.Sc., DATA ANALYTICS</b>	<b>BATCH: 2024 -2027</b>
<b>PART: III</b>	<b>COURSE COMPONENT: CORE – XVIII</b>
<b>COURSE NAME: PRACTICAL – VI - APPLIED TEXT ANALYTICS AND VISUALIZATION PITFALLS</b>	<b>COURSE CODE:</b>
<b>SEMESTER: VI</b>	<b>MARKS:100</b>
<b>CREDITS: 4</b>	<b>TOTAL HOURS:90</b>
<b>PRACTICAL</b>	

**COURSE OBJECTIVE:**

To explore the five components of Visual Text Analytics: parsing, concept derivation, topic derivation, text categorization, and sentiment analysis.

**COURSE OUTCOME:**

1. Understand the point-and-click interface of SAS Visual Text Analytics in Model Studio
2. Examine collections of text documents to discover key topics and concepts
3. Create robust models for categorizing the content
4. Identify common pitfalls in graphical visualizations
5. Demonstrate the measurement of distortion in graphs

**EXERCISES:**

1. Introduction to SAS Visual Text Analytics
2. SAS Visual Text Analytics Demonstrations
3. SAS Visual Text Analytics Nodes
4. Concept and Category Rule Definitions
5. Case Study on ASRS incident reports
6. Case Study on CFPB customer complaint reports
7. Introduction to graphicacy and data representation pitfalls
8. Common Data Misinterpretations and Paradoxes
9. Common Visual Misrepresentations
10. Common Remedies for Pitfalls in Visualization

**COURSE MATERIALS**

SAS Company Manual

**REFERENCE TEXT :**

SAS Internal Reference

**PSO – CO mapping**

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	3	2	3	3
CO 2	3	2	3	2	2
CO 3	3	3	3	3	3
CO 4	2	3	3	3	3
CO 5	3	3	2	3	3
Avg.	2.8	2.8	2.6	2.8	2.8

**PSO-CO-question paper mapping**

CO No:	COURSE OUTCOME	PSOs ADDRESSED	COGNITIVE LEVEL (K1 to K6)
CO1	Understand the point-and-click interface of SAS Visual Text Analytics in Model Studio	PSO1, PSO2, PSO3, PSO4, PSO5	K1, K2, K3, K4, K5
CO2	Examine collections of text documents to discover key topics and concepts	PSO1, PSO2, PSO3, PSO4, PSO5	K1, K2, K3, K4, K5
CO3	Create robust models for categorizing the content	PSO1, PSO2, PSO3, PSO4, PSO5	K1, K2, K3, K4, K5
CO4	Identify common pitfalls in graphical visualizations	PSO1, PSO2, PSO3, PSO4, PSO5	K1, K2, K3, K4, K5, K6
CO5	Demonstrate the measurement of distortion in graphs	PSO1, PSO2, PSO3, PSO4, PSO5	K1, K2, K3, K4, K5, K6

**K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create**

<b>PROGRAMME: B.Sc., DATA ANALYTICS</b>	<b>BATCH: 2024 -2027</b>
<b>PART: III</b>	<b>COURSE COMPONENT: ELECTIVE – III</b>
<b>COURSE NAME: BLOCKCHAIN TECHNOLOGIES</b>	<b>COURSE CODE:</b>
<b>SEMESTER: VI</b>	<b>MARKS:100</b>
<b>CREDITS: 5</b>	<b>TOTAL HOURS:90</b>
<b>THEORY</b>	

**COURSE OBJECTIVE:**

To impart knowledge of distributed ledgers in business and to acquire knowledge in emerging concepts using blockchain

**COURSE OUTCOMES:**

- 1.Explain the importance of distributed ledgers and need of blockchain
- 2.Describe decentralization concepts and apply consensus algorithms
- 3.Explain the basics of cryptography and its applications in cryptocurrencies
- 4.Apply various distributed ledgers for business
- 5.Make use of appropriate techniques for designing trust-based business networks

**UNIT I (18 Hours)**

Introduction - The growth of blockchain technology – Distributed Systems – P2P – Distributed Ledger – Cryptographically Secure - Generic Element of Blockchain – Benefits and limitation of blockchain– Tiers of BT – Types of Blockchain - Consensus – CAP Theorem and Blockchain.

**UNIT II (18 Hours)**

Decentralization: Methods of Decentralization – Routes to Decentralization – Smart Contract – Decentralized Organization – Platforms for Decentralization – Consensus Algorithms.

**UNIT III (18 Hours)**

Cryptocurrencies: Cryptographic Hash Functions – Cryptography basic and Concepts – Introduction Bitcoin – Bitcoin Network and Payments – Bitcoin clients and APIs – Alternative Coins.

**UNIT IV (18 Hours)**

Ethereum: Introduction – Ethereum Network – Components – Programming Languages; Hyperledger: Introduction – Reference Architecture – Fabric – Sawtooth Lake – Corda.

**UNIT V (18 Hours)**

Compilers: Solidity Compiler – Ganache – Metamask – Truffle; Languages: Solidity – Go – Java – NodeJS; Blockchain Use case: Financials – Insurance - Supply Chain Management – HealthCare - IoT.

### PRESCRIBED BOOKS:

1. Van Haren Publishing (Editor), "Introduction to Blockchain Technology: The Many Faces of Blockchain Technology in the 21st Century", Paperback Import, 2019.
2. Imran Bashir, "Mastering Blockchain" Packt 2nd Edition, 2018.
3. Adrian McNulty, "Blockchain: The Complete and Comprehensive Guide to Understanding Blockchain Technologies", Createspace Independent Pub, 2018.

### REFERENCES BOOKS:

1. Don, Alex Tapscott, "Blockchain Revolution". Portfolio Penguin 2016.
2. William Mougayar, "Business Blockchain Promise, Practice and Application of the Next Internet Technology", John Wiley & Sons 2016.
3. Tiana Laurence, "Blockchain for Dummies" John Wiley & Sons, 2017.

### E-LEARNING RESOURCES:

1. <https://www.simplilearn.com/tutorials/blockchain-tutorial>
2. <https://www.tutorialspoint.com/blockchain/index.htm>
3. <https://www.dappuniversity.com/articles/blockchain-tutorial>
4. <https://www.geeksforgeeks.org/blockchain/>

### GUIDELINES TO THE QUESTION PAPER SETTERS

#### QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions (each in 50 words)	1-12	3	30
B	Answer any 5 out of 7 questions (each in 300 words)	13-19	6	30
C	Answer any 4 out of 6 questions (each in 1200 words)	20-25	10	40
<b>TOTAL MARKS</b>				<b>100</b>



### BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	2	2
II	3	2	1
III	2	1	1
IV	2	1	1
V	2	1	1
<b>TOTAL</b>	12	7	6
<b>SECTION A – 12</b>		<b>SECTION B - 7</b>	<b>SECTION C - 6</b>

### PSO – CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	3	3	3
CO 2	3	3	2	3	2
CO 3	3	3	3	2	2
CO 4	3	2	3	2	3
CO 5	3	3	3	3	3
Avg.	3	2.8	2.8	2.6	2.6

**PSO-CO-question paper mapping**

<b>CO No:</b>	<b>COURSE OUTCOME</b>	<b>PSOs ADDRESSED</b>	<b>COGNITIVE LEVEL (K1 to K6)</b>
CO1	Explain the importance of distributed ledgers and need of blockchain	PSO 1 TO PSO 5	K1
CO2	Describe decentralization concepts and apply consensus algorithms	PSO 1 TO PSO 5	K2
CO3	Explain the basics of cryptography and its applications in cryptocurrencies	PSO 1 TO PSO 5	K3
CO4	Apply various distributed ledgers for business	PSO 1 TO PSO 5	K4
CO5	Make use of appropriate techniques for designing trust-based business networks	PSO 1 TO PSO 5	K5, K6

**K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create**

<b>PROGRAMME: B.Sc., DATA ANALYTICS</b>	<b>BATCH: 2024 -2027</b>
<b>PART: III</b>	<b>COURSE COMPONENT: ELECTIVE – III</b>
<b>COURSE NAME: ADVANCED APPLICATION DEVELOPMENT</b>	<b>COURSE CODE:</b>
<b>SEMESTER: VI</b>	<b>MARKS:100</b>
<b>CREDITS: 5</b>	<b>TOTAL HOURS:90</b>
<b>THEORY</b>	

### **COURSE OBJECTIVE:**

To understand all the necessary and important technologies such as MongoDB, Express.js, AngularJS, and Node.js.

### **COURSE OUTCOMES:**

1. Store the data in NoSQL, document-oriented MongoDB database that brings performance and scalability.
2. Use Node.js and Express Framework for building fast, scalable network applications
3. Use AngularJS framework that offers declarative, two-way data binding for web applications.
4. Integrate the front-end and back-end components of the MEAN stack.
5. Develop robust mobile applications using Flutter.

### **UNIT I**

**(18 Hours)**

Node.js (N): Introduction to Node.js. Installing Node.js. The package.json File. The Node.js Event Loop. The I/O Cycle. The Anatomy of a Node.js Module. Creating Node Modules. Exploring the Node.js HTTP Module. Creating an HTTP Webserver with Node.js. Responding to HTTP Requests. Routing in Node.js. Creating a Sample Node.js Application.

### **UNIT II**

**(18 Hours)**

MongoDB(M): Introduction to MongoDB. Installing MongoDB. Using MongoDB Compass. Using Mongo Shell Interface. Connecting to MongoDB. Creating Schemas and Models. Querying Documents Using find(). Inserting Documents Using create(). Updating Documents Using findOneAndUpdate(). Deleting Documents Using findOneAndDelete() & deleteMany()

### **UNIT III**

**(18 Hours)**

Server-Side Development with Express (E): Introduction to the Express Framework. Installing and Testing Express. Creating a Node.js Express App. Restructuring an Express App. Creating Templates. Using Express Middleware Functions. Creating the List Page. Creating the Details Page. Creating the Edit Page. Creating the Add Page. Deleting Data. REST API Basics. Testing REST APIs. Refactoring APIs.

### **UNIT IV**

**(18 Hours)**

Understanding Angular.JS(A): Getting Started with Angular. Creating an Angular Application. Angular Project File Structure. Anatomy of an Angular Component. One-way Data Binding. Two-way Data Binding. Using NgIf Directive. Using NgForOf Directive. Angular Modules. Creating NgModulesUsing Angular Router. Configuring Templates. Creating Navigations. Working with Template-driven Forms. Working with Reactive Forms. Validating Form Data. Services Dependency Injection (DI). Reading Data from Database. Inserting Data into Database. Updating Data in the Database. Delete Data from Database.

**UNIT V****(18 Hours)**

Understanding Flutter: Importance of Flutter, Flutter Framework, Android Studio, Flutter SDK, Installing and Configuring Flutter SDK. Dart Programming: main() function, Dart Variables, Dart Data Types, Dart Conditional Operators, Control Flow & Loops. Dart Functions - Functions, Function Structure, creating a Function, Function Returning Expression. Object-Oriented Programming (OOP) - Creating a Class, Adding Methods to Classes, Class — Getters and Setters, Class Inheritance, Abstract Class. Flutter Widgets Fundamentals: Scaffold Widget, Image Widget, Container Widget, Column and Row Widgets, Icon Widget, Layouts in Flutter, Card Widget, Hot Reload and Hot Restart, Stateful and Stateless Widgets Navigation and Routing: Button Widget, App Structure and Navigation, Navigate to a New Screen and Back, Navigate with Named Routes, Send and Return Data among Screens, Animate a Widget across Screens, WebView Widget in Flutter.

**PRESCRIBED BOOKS:**

1. Node.js, MongoDB and Angular Web Development: The definitive guide to using the MEAN stack to build web applications by Brad Dayley, Brendan Dayley, Caleb Dayley, Pearson, 2018.
2. Beginning Flutter: A Hands On Guide to App Development by Marco L. Napoli, Wrox, 2019.

**REFERENCE BOOKS:**

1. Full Stack Javascript Development with Mean - MongoDB, Express, AngularJS, and Node.JS by Adam Bretz, Colin J Ihrig, Shroff/SitePoint, 2015.
2. Practical Flutter by Zammetti Frank, Apress, 201.

**GUIDELINES TO THE QUESTION PAPER SETTERS QUESTION  
PAPER PATTERN**

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
<b>A</b>	<i>Answer any 10 out of 12 questions(each in 50 words)</i>	<i>1-12</i>	<i>3</i>	<i>30</i>
<b>B</b>	<i>Answer any 5 out of 7 questions(each in 300 words)</i>	<i>13-19</i>	<i>6</i>	<i>30</i>
<b>C</b>	<i>Answer any 4 out of 6 questions(each in 1200 words)</i>	<i>20-25</i>	<i>10</i>	<i>40</i>
<b>TOTAL MARKS</b>				<b>100</b>

**BREAK UP OF QUESTIONS**

UNITS	SECTION A	SECTION B	SECTION C
I	2	2	1
II	2	2	1
III	3	1	2
IV	3	1	1
V	2	1	1
<b>TOTAL</b>	<b>12</b>	<b>7</b>	<b>6</b>
<b>SECTION A – 12</b>		<b>SECTION B – 7</b>	<b>SECTION C - 6</b>

**PSO – CO mapping**

	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO 1</b>	3	3	2	3	3
<b>CO 2</b>	3	3	3	2	2
<b>CO 3</b>	3	2	3	3	3
<b>CO 4</b>	2	3	3	2	3
<b>CO 5</b>	3	3	3	2	3
<b>Avg.</b>	2.8	2.8	2.8	2.8	2.8

**PSO-CO-question paper mapping**

<b>CO No:</b>	<b>COURSE OUTCOME</b>	<b>PSOs ADDRESSED</b>	<b>COGNITIVE LEVEL (K1 to K6)</b>
CO1	Understand and Store the data in NoSQL, document-oriented MongoDB database that brings performance and scalability	PSO1, PSO2, PSO3, PSO4, PSO5	K1
CO2	Use Node.js and Express Framework for building fast, scalable network applications.	PSO1, PSO2, PSO3, PSO4, PSO5	K2
CO3	Use AngularJS framework that offers declarative, two-way data binding for web applications.	PSO1, PSO2, PSO3, PSO4, PSO5	K3
CO4	Integrate the front-end and back-end components of the MEAN stack.	PSO1, PSO2, PSO3, PSO4, PSO5	K4
CO5	Develop robust mobile applications using Flutter.	PSO1, PSO2, PSO3, PSO4, PSO5	K5, K6

**K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create**

<b>PROGRAMME: B.Sc., DATA ANALYTICS</b>	<b>BATCH: 2024 -2027</b>
<b>PART: III</b>	<b>COURSE COMPONENT: ELECTIVE – III</b>
<b>COURSE NAME: MANAGEMENT INFORMATION SYSTEM</b>	<b>COURSE CODE:</b>
<b>SEMESTER: VI</b>	<b>MARKS:100</b>
<b>CREDITS: 5</b>	<b>TOTAL HOURS:90</b>
<b>THEORY</b>	

**COURSE OBJECTIVE:**

To equip students with the necessary knowledge in Management Information System.

**COURSE OUTCOMES:**

1. Understand MIS support for planning.
2. Acquire knowledge on Concept of System.
3. Familiarize Computers and Information Processing.
4. Understand and evaluate System Analysis and design.
5. Illustrate Decision Support Systems.

**UNIT I**

**(18 Hours)**

Definition of Management Information System - MIS support for planning, Organizing and controlling - Structure of MIS - Information for decision -making.

**UNIT II**

**(18 Hours)**

Concept of System - Characteristics of System - Systems classification - Categories of Information Systems - Strategic information system and competitive advantage.

**UNIT III**

**(18 Hours)**

Computers and Information Processing - Classification of computer - Input Devices – Output devices - Storage devices, - Batch and online processing. Hardware - Software. Database management Systems.

**UNIT IV**

**(18 Hours)**

System Analysis and design - SDLC - Role of System Analyst - Functional Information system - Personnel, production, material, marketing.

**UNIT V**

**(18 Hours)**

Decision Support Systems - Definition. Group Decision Support Systems - Business Process Outsourcing - Definition and function.

**PRESCRIBED BOOKS:**

1. Mudrick& Ross , "Management Information Systems", Prentice - Hall of India.

**REFERENCE BOOKS:**

1. Sadagopan , "Management Information Systems" - Prentice- Hall of India
2. C SV Murthy - "Management Information Systems" Himalaya publishing House.
3. Dr. S.P. Rajagopalan, "Management Information Systems and EDP ", Margham Publications, chennai.

## E-LEARNING RESOURCES:

1. [www.tutorialspoint.com/management\\_information\\_system/management\\_information\\_system.html](http://www.tutorialspoint.com/management_information_system/management_information_system.html).
2. <https://www.mtu.edu/business/what-is-mis>.

## GUIDELINES TO THE QUESTION PAPER SETTERS

### QUESTION PAPER PATTERN

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
A	Answer any 10 out of 12 questions (each in 50 words)	1-12	3	30
B	Answer any 5 out of 7 questions (each in 300 words)	13-19	6	30
C	Answer any 4 out of 6 questions (each in 1200 words)	20-25	10	40
<b>TOTAL MARKS</b>				<b>100</b>

### BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	3	2	2
II	3	2	1
III	2	1	1
IV	2	1	1
V	2	1	1
<b>TOTAL</b>	12	7	6
<b>SECTION A – 12</b>		<b>SECTION B - 7</b>	<b>SECTION C - 6</b>

### PSO-CO mapping

	PSO 1	PSO 2	PSO 3	PSO 4	PSO5
CO 1	3	3	3	3	3
CO 2	3	2	3	3	2
CO 3	3	3	3	2	2
CO 4	3	3	3	2	3
CO 5	3	3	3	3	3
Avg.	3	2.8	3	2.6	2.6

**PSO-CO-question paper mapping**

<b>CO No:</b>	<b>COURSE OUTCOME</b>	<b>PSOs ADDRESSED</b>	<b>COGNITIVE LEVEL (K1 to K6)</b>
CO1	Understand MIS support for planning.	PSO 1 TO PSO 5	K1
CO2	Acquire knowledge on Concept of System.	PSO 1 TO PSO 5	K2
CO3	Familiarize Computers and Information Processing.	PSO 1 TO PSO 5	K3
CO4	Understand and evaluate System Analysis and design.	PSO 1 TO PSO 5	K4
CO5	Illustrate Decision Support Systems.	PSO 1 TO PSO 5	K5, K6

**K1= Remember, K2= Understand, K3= Apply, K4=Analyse, K5= Evaluate, K6= Create**



## UG- SOFT SKILLS

<b>SOFT SKILLS: COMMON TO ALL</b>	<b>BATCH: 2024- 2025 ONWARDS</b>
<b>PART: IV</b>	<b>COURSE COMPONENT: SOFT SKILL-I</b>
<b>COURSE NAME: COMMUNICATION SKILLS AND PERSONALITY DEVELOPMENT SKILLS</b>	<b>COURSE CODE:</b>
<b>SEMESTER: I</b>	<b>MARKS:100</b>
<b>CREDITS: 2</b>	<b>TOTAL HOURS: 30</b>
<b>THEORY</b>	

### **COURSE OBJECTIVE:**

To build communication skills for personal and professional development.

### **COURSE OUTCOMES:**

1. Students will demonstrate the ability to actively listen to others, understand diverse perspectives, and paraphrase key points accurately, enhancing their comprehension skills in various personal and professional contexts.
2. Students will be able to articulate thoughts, ideas, and information clearly and concisely, using appropriate language and structure to convey messages effectively in both written and verbal communication
3. Students will develop confidence in expressing opinions, asserting boundaries, and advocating for themselves and others, leading to enhanced self-assurance and effectiveness in interpersonal and group communication.
4. Students will learn to adapt their communication style and approach based on the audience, context, and purpose of communication, fostering flexibility and versatility in interacting with diverse individuals and groups.
5. Students will acquire techniques for resolving conflicts, managing disagreements, and negotiating mutually beneficial outcomes through effective communication strategies, promoting constructive problem-solving and collaboration in personal and professional settings.

### **UNIT I Types of Communication**

**(6 Hours)**

Verbal Communication - Nonverbal Communication - Visual Communication - Written Communication - Interpersonal Communication - Group Communication - Mass Communication - Digital Communication- Barriers – Language- Cultural- Psychological- Semantic- Technological Barriers

### **UNIT II Etiquette & Ethical Practices in Communication**

**(6 Hours)**

Active Listening - Respectful Language - Clarity and Conciseness – Truthfulness-Professionalism-Tone - Timeliness - Constructive Feedback - Confidentiality - Cultural Sensitivity - - Emotional Intelligence- Social Intelligence- Social Etiquettes-Accountability

### **UNIT III Self Actualization**

**(6 Hours)**

SWOC Analysis- Self Regulation-Self Evaluation, Self-Monitoring, Self- Criticism, Self- Motivation, Self-awareness and Reflection:

### **UNIT IV III Leadership and Teamwork**

**(6 Hours)**

Leadership Skills: Leadership styles- Goal-setting and decision-making- Motivation and influence- Team Dynamics: Team building activities- Conflict resolution- Collaborative problem-solving

## **UNIT V Stress and Time Management**

**( 6 Hours)**

Definition of Stress, Types of Stress, Symptoms of Stress, Stress coping ability, Stress Inoculation Training, Time Management and Work-Life Balance: Self-discipline Goal-setting

### **RECOMMENDED TEXTBOOKS**

1. Goleman, Daniel (2006) *Emotional Intelligence*, Bantam Books
2. Linden, Wolfgang (2004) *Stress Management- From Basic Science to Better Practice-* University of British Columbia, Vancouver, Canada.
3. Hasson, Gill (2012) *Brilliant Communication Skills*. Great Britain: Pearson Education.
4. Monippally, Matthukutty, M. *Business Communication Strategies*. New Delhi: Tata McGraw-Hill Publishing Company Ltd., 2001.
5. Raman, Meenakshi & Sangeetha Sharma (2011) *Communication Skills*, Oxford University Press.

### **REFERENCE BOOKS**

1. N.Krishnaswamy *Current English for College* (1st Edition) - Trinity Press
2. Wood, Julia T (2015) *Interpersonal Communication: Everyday Encounters* 8th Edition, Cengage Learning.

### **E-LEARNING RESOURCES**

1. <http://www.albion.com/netiquette/corerules.html>
2. <http://www.englishdaily626.com/c-errors.php>
3. <https://www.helpguide.org/articles/relationships-communication/nonverbal-communication.htm>
4. <https://www.communicationtheory.org/verbal-vs-non-verbal-communication-with-examples/>
5. <https://letstalkscience.ca/educational-resources/backgrounders/digital-citizenship-ethics>
6. <https://www.switchboard.app/learn/article/teamwork-leadership-skills>

## GUIDELINES TO THE QUESTION PAPER SETTERS

### QUESTION PAPER PATTERN

Section	Question Component	Numbers	Marks	Total
<b>A</b>	Answer any 5 out of 7 questions (answer in 50 words)	1-7	2	<b>10</b>
<b>B</b>	Answer any 4 out of 6 questions (answer in 300 words)	8-13	5	<b>20</b>
<b>C</b>	Answer any two( Internal (Choice)	14-15	10	<b>20</b>
	Internal & Viva Voce		50	<b>50</b>

### BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	2	<b>2</b>	----
II	2	<b>1</b>	1
III	1	<b>1</b>	1
IV	1	<b>1</b>	1
V	1	<b>1</b>	1
<b>TOTAL</b>	7		
<b>SECTION A – 7</b>		<b>SECTION B – 6</b>	<b>SECTION C - 4</b>

<b>SOFT SKILLS: COMMON TO ALL</b>	<b>BATCH: 2024- 2025</b>
<b>PART: IV</b>	<b>COURSE COMPONENT: SOFT SKILL-II</b>
<b>COURSE NAME: INTERVIEW SKILLS AND RESUME WRITING</b>	<b>COURSE CODE:</b>
<b>SEMESTER: II</b>	<b>MARKS:100</b>
<b>CREDITS: 2</b>	<b>TOTAL HOURS: 30</b>
<b>THEORY</b>	

**COURSE OBJECTIVE:**

To equip the students to acquire the relevant skills for better employability.

**COURSE OUTCOMES:**

1. Students will gain an overall understanding of the concept, the purpose, and the objectives of an interview
2. Students will become aware of the various types of interviews and the nuances of each one of them
3. Students will understand and equip themselves with the techniques and strategies required to ace an interview
4. Students will be able to draft a biodata /CV/Resume in the proper format
5. Students will embark on acquiring the relevant skills and will learn to leverage them effectively for better employability

**UNIT I Introduction to Interview Skills**

**(6 Hours)**

Definition- meaning- concept of interview –Purpose- Objectives of interview-Characteristic features of job interviews

**UNIT II Types of Interview**

**(6 Hours)**

Traditional one on one job interview- Panel interview- Behavioral interview-Group interview- Phone Interview- Preliminary Interview-Patterned Interview Depth Interview, Stress Interview, Exit Interview- Interview through tele and video conferencing

**UNIT III Interviews: Techniques and Strategies**

**(6 Hours)**

Preparing for the Interview Process- Before the interview-During the interview-After the interview -Tips to ace an interview -Commonly asked questions in interview -Do’s and Don’ts of interview - Reasons for rejections

**UNIT IV Preparing Biodata/CV/Resume**

**(6 Hours)**

Essential characteristics of a job Application-Difference between Biodata- CV-Resume-covering letter-Tips to draft an application

**UNIT V Leveraging Employability Skills**

**(6 Hours)**

Personality Development-Organizational skills-Time Management–Stress Management-Effective Communication Skills -Reasoning Ability-Verbal Ability- Group Discussion-Technical skills - Presentation skills

**RECOMMENDED TEXTBOOKS**

1. Monipally, Matthukutty M. (2017) *Business Communication: From Principles to Practice*
2. Peter, Francis. (2012) *Soft Skills and Professional Communication*. New Delhi: Tata McGraw Hill.

## REFERENCE BOOKS

1. Higgins, Jessica JD (2018) *10 Skills for Effective Business Communication: Practical Strategies from the World's Greatest Leaders*
2. Nicholas, Sonji (2023) *Interviewing: Preparation, Types, Techniques, and Questions*, Pressbooks
3. Storey, James (2016) *The Art of The Interview: The Perfect Answers to Every Interview Question*

## E-LEARNING RESOURCES

1. <https://careermobilityoffice.cs.ny.gov/cmo/documents/Resume%20&%20Interviewing%20Handout.pdf>
2. <https://edu.gcfglobal.org/en/interviewingskills/interview-etiquette/1/>
3. <https://findjobhub.com/en/types-of-interviews>
4. <https://egyankosh.ac.in/bitstream/123456789/23411/1/Unit-2.pdf>
5. [https://bharatskills.gov.in/pdf/E\\_Books/CTS/ES/English/ES\\_Part\\_1\\_62%20hour\\_English.pdf](https://bharatskills.gov.in/pdf/E_Books/CTS/ES/English/ES_Part_1_62%20hour_English.pdf)
6. [https://bharatskills.gov.in/pdf/E\\_Books/CTS/ES/English/ES\\_Part2\\_58hour\\_English.pdf](https://bharatskills.gov.in/pdf/E_Books/CTS/ES/English/ES_Part2_58hour_English.pdf)

## GUIDELINES TO THE QUESTION PAPER SETTERS

### QUESTION PAPER PATTERN

Section	Question Component	Numbers	Marks	Total
A	Answer any 5 out of 7 questions (answer in 50 words)	1-7	2	10
B	Answer any 4 out of 6 questions (answer in 300 words)	8-13	5	20
C	Answer any two( Internal (Choice)	14-15	10	20
	Internal & Viva Voce		50	50

### BREAK UP OF QUESTIONS

UNITS	SECTION A	SECTION B	SECTION C
I	2	2	----
II	2	1	1
III	1	1	1
IV	1	1	1
V	1	1	1
<b>TOTAL</b>			
<b>SECTION A – 7</b>		<b>SECTION B – 6</b>	<b>SECTION C - 4</b>

<b>PROGRAMME: COMMON TO ALL IT STUDENTS, B.Com., ISM, B.Com., CA</b>	<b>BATCH: 2024-2027</b>
<b>PART: IV</b>	<b>COURSE COMPONENT: SOFT SKILL III</b>
<b>COURSE NAME: ADOBE UX FOUNDATION</b>	<b>COURSE CODE:</b>
<b>SEMESTER: III</b>	<b>MARKS: 100</b>
<b>CREDITS: 2</b>	<b>TOTAL HOURS: 30</b>
<b>PRACTICAL</b>	

### **COURSE OBJECTIVE:**

Adobe UX Foundation involves outlining the key skills and knowledge that participants should acquire by the end of the course.

### **COURSE OUTCOMES:**

1. Define and explain the core concepts and principles of user experience.
2. Understand the key features and functionalities of Adobe XD for designing and prototyping.
3. Apply user-centered design principles to create interfaces that prioritize user needs and preferences.
4. Implement interactive and dynamic prototypes to simulate user interactions.
5. Explore collaboration tools within Adobe XD to work efficiently in a team environment.

### **UNIT I (6 HOURS)**

**Introduction to User Experience Design:** Define User Experience - User Experience Process – Seven Components of user Experience (UX) – Definition of a Good User Experience Design-Usability Heuristics-Examples of Good User Experience Design – Practical Activity.

### **UNIT II (6 HOURS)**

**User Experience Research:** What is User Experience Research – Designing Adobe XD :User Research & Testing – What is Competitor User Experience Research – User Experience Personas & User Profiles – Other types of User Experience Research – Qualitative and Quantitative User Experience Research – Running Interviews and Observations for User Experience –Understanding User – Practical Activity

### **UNIT III (6 HOURS)**

**Visual Design :** Definition- Introduction to Atomic Design – Elements of any Visual design:Color & Shape – Imagery – Typography - Buttons – Composition of Visual Design Elements: structure & Grid – Hierarchy of Content – States.

### **UNIT IV (6 HOURS)**

**User Experience Design Strategy:** An Introductory guide to information architecture – Techniques & Best practice for developing an information architecture: Software Process – Examples of Information Architecture – Sitemap – Sitemap for website – Examples – Navigation & Hierarchy : Taxonomy & metadata – Examples- Practical Activity

### **UNIT V (6 HOURS)**

**Mock up :** Different types of Design Mock –Ups – User Persona,Scenarios & stories – Design Ideation & Sketching – Storyboarding User Experiences – Design Wireframes –Design prototyping & types of prototypes – Practical Activity.

**PRESCRIBED BOOKS:**

1. The Design of Everyday Things by Don Norman, The revised and expanded edition,2013.
2. Lean UX: Designing Great Products with Agile Teams by Jeff Gothelf and Josh Seiden, 2013.

**REFERENCE BOOKS:**

1. Don't Make Me Think by Steve Krug, 3<sup>rd</sup> edition, 2014
2. The Elements of User Experience by Jesse James Garrett, 2<sup>nd</sup> edition, 2010
3. Information Architecture: For the Web and Beyond" by Louis Rosenfeld, Peter Morville, and Jorge Arango, 4<sup>th</sup> edition,2015.
4. Sketching User Experiences: Getting the Design Right and the Right Design" by Bill Buxton, 1<sup>st</sup> edition,2007.
5. About Face: The Essentials of Interaction Design" by Alan Cooper, Robert Reimann, and David Cronin, 4<sup>th</sup> edition, 2015.

**E-LEARNING RESOURCES:**

1. <https://learn.futureskillsprime.in/journey/adobe-ux-foundation-learning-journey-this-free-of-cost>.
2. <https://userresearch.google.com/>
3. <https://www.interaction-design.org/literature/topics/visual-design>
4. <https://www.nngroup.com/articles/ux-strategy/>
5. <https://www.mockupworld.co/>

**PSO – CO mapping**

	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO5</b>
<b>CO 1</b>	3	3	2	3	2
<b>CO 2</b>	3	3	2	2	2
<b>CO 3</b>	2	3	3	2	3
<b>CO 4</b>	3	2	2	3	2
<b>CO 5</b>	2	2	2	2	2

**PSO-CO-question paper mapping**

<b>CO No:</b>	<b>COURSE OUTCOME</b>	<b>PSOs ADDRESSED</b>	<b>COGNITIVE LEVEL (K1 to K6)</b>
CO1	Define and explain the core concepts and principles of user experience.	PSO1,PSO2,PSO3, PSO4,PSO5	K1
CO2	Illustrate the key features and functionalities of Adobe XD for designing and prototyping.	PSO1,PSO2,PSO3, PSO4,PSO5	K2
CO3	Apply user-centered design principles to create interfaces that prioritize user needs and preferences.	PSO1,PSO2,PSO3, PSO4,PSO5	K3
CO4	Implement interactive and dynamic prototypes to simulate user interactions.	PSO1,PSO2,PSO3, PSO4,PSO5	K4
CO5	Explore collaboration tools within Adobe XD to work efficiently in a team environment.	PSO1,PSO2,PSO3, PSO4,PSO5	K5

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



<b>PROGRAMME: ALL UG</b>	<b>BATCH: 2024 – 2027</b>
<b>PART: IV</b>	<b>COURSE COMPONENT: SOFT SKILL – IV</b>
<b>COURSE NAME: FOUNDATIONS OF QUANTITATIVE APTITUDE</b>	<b>COURSE CODE:</b>
<b>SEMESTER: IV</b>	<b>MARKS:100</b>
<b>CREDITS: 2</b>	<b>TOTAL HOURS: 30</b>
<b>THEORY AND PROBLEMS</b>	

CO

**COURSE OBJECTIVE:**

Develop learners' problem-solving skills and critical thinking abilities in the context of recruitment aptitude tests.

**COURSE OUTCOME:**

1. The learner will be able to recognize, describe and represent patterns and relationships, as well as to solve problems using algebraic language and skills.
2. To learn about factors and multiples that numbers have in common with each other.
3. The student will analyse monthly profit and loss statements for a school store and calculate profit margin percentages.
4. Students learn what different types of interest are, where it occurs in real life and understand the concept of simple and compound interests.
5. The learner will draw, interpret and compare pie charts, bar charts and frequency diagrams.

**UNIT I: Number system and Number series****(6 HOURS)**

**Numbers:** Numbers and their classification, test for divisibility of numbers, General properties of divisibility, division and remainder, remainder rules.

**Number Series:** Number series, three steps to solve a problem on series, two-line number series, sum rules on natural numbers.

**UNIT II: HCF and LCM of Numbers****(6 HOURS)**

Factors, Multiples, Principal of Prime factorization, Highest Common Factor (HCF) and Least Common Multiple (LCM), Product of two numbers, Difference between HCF and LCM.

**UNIT III: Percentage, Profit and Loss****(6 HOURS)**

**Percentage:** Introduction, fraction to rate percent, rate percent to fraction, rate percent of a number, express a given quantity as a percentage of another given quantity, convert a percentage into decimals and convert a decimal into percentage.

**Profit and Loss:** Gain/Loss and % gain and % loss, relation among Cost price, Sale price, Gain/Loss and % gain and % loss.

**UNIT IV: Simple Interest and Compound Interest****(6 HOURS)**

**Simple Interest:** Definition, effect of change of  $P$ ,  $R$  and  $T$  on Simple Interest, amount.

**Compound Interest:** Introduction, conversion period, basic formula, to find the Principal/Rate/Time, Difference between Simple Interest and Compound Interest.

**UNIT V: Data interpretation****(6 HOURS)**

Tabulation, Bar Graphs, Pie Charts, Line Graphs, average.

**PRESCRIBED BOOK:**

1. Quantitative Aptitude by R.S. Agarwal

**REFERENCE BOOKS:**

1. Quantitative Aptitude by Abhijit Guha, Fourth Edition.
2. Quantitative Aptitude by Ramandeep Singh.

**E - LEARNING RESOURCES:**

1. <https://byjus.com/maths/numeralsystem/#:~:text=crore%20is%207.International%20Numeral%20System,8%20%E2%80%93%20Ones>
2. <https://byjus.com/maths/hcf-and-lcm/>
3. <https://byjus.com/maths/profit-loss-percentage/>
4. <https://www.vedantu.com/jee-main/maths-difference-between-simple-interest-and-compound-interest>
5. <https://sites.utexas.edu/sos/guided/descriptive/descriptivec/frequency/>

**GUIDELINES TO THE QUESTION PAPER SETTERS****QUESTION PAPER PATTERN**

SECTION	QUESTION COMPONENT	NUMBERS	MARKS	TOTAL
<b>A</b>	<b>Multiple Choice Questions:</b> Answer 20 out of 20 questions (each question carries one mark)	1 – 20	20	20
<b>B</b>	Answer any 5 out of 7 questions (each question carries 6 marks)	21 – 27	6	30
<b>TOTAL MARKS</b>				<b>50</b>

**BREAK UP OF QUESTIONS FOR PROBLEMS**

UNITS	SECTION A	SECTION B
<b>I</b>	4	1
<b>II</b>	4	1
<b>III</b>	4	1
<b>IV</b>	4	1
<b>V</b>	4	1
<b>Any Unit</b>	-	2
<b>TOTAL</b>	<b>20</b>	<b>7</b>

<b>PROGRAMME: COMMON TO ALL</b>	<b>BATCH: 2024-2027</b>
<b>PART: III</b>	<b>COURSE COMPONENT:</b>
<b>COURSE NAME: INDIAN HERITAGE AND KNOWLEDGE SYSTEM</b>	<b>COURSE CODE:</b>
<b>SEMESTER: III</b>	<b>MARKS:100</b>
<b>CREDITS: 2</b>	<b>TOTAL HOURS: SELF-STUDY</b>
<b>QUESTION PATTERN: MCQ</b>	
<b>THEORY</b>	

### **Course Objectives:**

*Delving into Indian Heritage, this course focuses on South Indian cultures and ancient knowledge like Yoga, Ayurveda, and Siddha, shaping the Nation's identity.*

### **Course Outcomes:**

1. To develop a comprehensive understanding among students of Indian heritage, its richness and diversity, and its role in shaping the nation's cultural identity.
2. Students will gain an enhanced insight into the artistic, architectural, and literary achievements of South India and other regions, fostering a sense of pride in Indian cultural heritage.
3. To enhance students' cultural literacy by gaining insights into traditional practices preserved through folklore across India.
4. To acquire knowledge among students of ancient Indian sciences for holistic well-being, promoting physical, mental, and spiritual health.
5. Students will develop a deeper understanding of the interconnectedness of spiritual, medicinal, and artistic dimensions within Indian Heritage systems.

### **UNIT I: Introduction to Indian Heritage**

- **Concept of Heritage:** Definition, the importance of studying heritage, and its diverse forms.
  - **Cultural Landscape of India:** Overview of major cultural zones in India, with a focus on South India.
- Key Concepts:** Cultural heritage, diversity, tangible heritage (e.g., monuments), intangible heritage (e.g., traditions, practices).

### **UNIT II: Cultural Tapestry of South India**

- **Literature:** The classical Tamil literature of Sangam poetry, the epic Kannada works like the "Kuvempu Ramayana," the Telugu compositions of Annamacharya, and the poetic Malayalam works of Kerala's rich literary tradition.
- **Painting:** The intricate gold leaf work of Tanjore painting, the intricate patterns of Mysore painting, hand-painting or block-printing of Kalamkari.
- **Theatre:** The ancient art form of Koothu and the elaborate dance-dramas of Bhagavata Mela in Tamil Nadu, and the colourful folk theatre of Yakshagana in Karnataka.
- **UNESCO Indian Heritage Sites:** Great Living Chola Temples artistry, Hampi-Virupaksha Temple and the Vijaya Vittala Temple, Mahabalipuram- a treasure trove of Pallava art, Mysore Palace-Indo-Saracenic architecture, Periyar National Park- Western Ghats, Kanchipuram-City of Thousand Temples

### **UNIT III: Tamil Nadu Folklores**

- **Origins and Significance:** Historical background of Tamil Nadu folklore and its cultural significance.
  - **Folk Dances:** Exploration of traditional Tamil folk dances like Karakattam, Kolattam, and Kummi.
  - **Folk Music:** Overview of folk music traditions in Tamil Nadu, including Parai Attam and Villu Paatu.
  - **Rituals and Festivals:** Understanding the role of folklore in Tamil Nadu's rituals and festivals- Pongal and Jallikattu.
- Key Concepts:** Karakattam, Kolattam, Parai Attam, Villu Paatu, Tamil folk tales, cultural rituals.

### **UNIT IV: Unveiling the Knowledge Systems**

- **Cultural Landscape of India:** Overview of major cultural zones in India, with a focus on South India.
  - **Yoga:** Exploring the various aspects of Yoga - its philosophy, Eight Limbs, practices (e.g., Asanas, Pranayama), and benefits for physical and mental well-being.
  - **Ayurveda:** Understanding the core principles of Ayurveda - its focus on holistic health, diagnosis, and treatment methods.
- Key Concepts:** Yoga philosophy, Asanas, Pranayama, Tridosha theory (Ayurveda), Doshas (Vata, Pitta, Kapha), Panchakarma, herbal medicine, Ayurvedic lifestyle.

### **UNIT V: Siddha Tradition and Other Knowledge Systems**

- **Siddha Tradition:** Origins, philosophy, medicinal practices, and spiritual aspects.
  - **Other Important Knowledge Systems:** Jyotish Shastra (Indian astrology), Natya Shastra (Treatise on performing arts).
- Key Concepts:** Siddha literature, alchemy, and spirituality in Siddha tradition. Pancha Boothas (Siddha), herbal remedies, Planetary influences, elements of classical Indian dance and music, and aesthetics in Natya Shastra.

**Question Paper Pattern : MCQ**

<b>PROGRAMME: COMMON TO ALL</b>	<b>BATCH: 2024-2027</b>
<b>PART: IV</b>	<b>COURSE COMPONENT: SELF-STUDY</b>
<b>COURSE NAME: CONTEMPORARY WORLD AND SUSTAINABLE DEVELOPMENT</b>	<b>COURSE CODE:</b>
<b>SEMESTER: III</b>	<b>MARKS:100</b>
<b>CREDITS: 2</b>	<b>TOTAL HOURS: SELF-STUDY</b>
<b>QUESTION PATTERN: MCQ</b>	
<b>THEORY</b>	

### Course Objectives:

*Delving into global dynamics, this course highlights Asia and India's pivotal role in achieving global sustainability objectives.*

### Course Outcomes:

1. Students will gain a comprehensive understanding of the key actors, institutions, and dynamics shaping the contemporary world order.
2. Students will acquire the ability to analyze the political, economic, and security challenges within major Asian regions, fostering informed perspectives on these critical issues.
3. Through the study of recent wars, students will develop critical thinking skills to assess the root causes, human costs, and potential solutions to contemporary conflicts.
4. Students will gain a deeper understanding of the principles and challenges of sustainable development, empowering them to advocate for responsible solutions at local, national, and international levels.
5. Students will be equipped to critically evaluate India's contributions to the SDGs, particularly through specific programs implemented in Tamil Nadu, and assess their effectiveness in achieving sustainable development goals.

### UNIT I: Global Governance and Institutions

- **State & Non-State Actors:** Definition, types (nation-states, failed states), functions.  
*Key Actors: International states, Intergovernmental organizations (IGOs), nongovernmental organizations (NGOs), multinational corporations (MNCs).*
- **United Nations (UN):** Structure, key organs (General Assembly, Security Council), functions, WB, & others.  
*Key Concepts: United Nations General Assembly, United Nations Security Council.*
- **Regional Organizations:** European Union (EU), African Union (AU), North Atlantic Treaty Organization (NATO)  
*Key Concepts: European Union Commission, African Union Commission, North Atlantic Treaty Organization.*
- **International Law and Treaties:** Significance, role in addressing global challenges.  
*Key Concepts: International Court of Justice, International Criminal Court, Geneva Conventions.*

### UNIT II: Contemporary Asia

#### Major Geographical Regions

- **Middle East:** Characterized by rich oil reserves, Complex political dynamics, and ongoing conflicts.  
*Key countries: Iran, Iraq, Israel, Saudi Arabia, Syria, Turkey*
  - **Southeast Asia:** Rapid economic growth, Challenges- maritime security and environmental degradation.  
*Key countries: Indonesia, Malaysia, Philippines, Singapore, Thailand, Vietnam*
  - **Far East:** Major economic powerhouses and Potential flashpoints.  
*Key countries: China, Japan, North Korea, South Korea*
  - **Rise of China:** Political-South China Sea, Territorial disputes and Competition for Resources. Economic- China's Belt and Road Initiative (BRI)
  - **Major Economic Centers:** **Singapore-** Global financial hub, **Hong Kong-** Special Administrative Region of China, **United Arab Emirates (UAE)-** Diversified economy driven by oil and gas, tourism, and trade.
- Regional Organizations:**
- Association of Southeast Asian Nations (ASEAN)
  - South Asian Association for Regional Cooperation (SAARC)
  - Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC)
  - Asia-Pacific Economic Cooperation (APEC)
  - Shanghai Cooperation Organization (SCO)

### UNIT III: Recent Wars of the World

- **Syrian Civil War (2011-present):** Bashar al-Assad regime, Syrian opposition groups, ISIS.  
*Key Concepts: Origins of the conflict, humanitarian crisis, foreign intervention, refugee crisis.*
- **Yemeni Civil War (2015-present):** Houthi rebels, Yemeni government, Saudi-led coalition.  
*Key Concepts: Proxy war dynamics, humanitarian crisis, role of Iran and Saudi Arabia, UN peace efforts.*
- **Ukraine Conflict (2014-present):** Ukrainian government, Russian-backed separatists, Russia.  
*Key Concepts: Annexation of Crimea, Donbas region conflict, Minsk agreements, NATO-Russia tensions.*
- **Ethiopia Civil War (2020-present):** Ethiopian government, Tigray People's Liberation Front (TPLF), Eritrean forces.  
*Key Concepts: Tigray conflict, humanitarian crisis, regional implications, efforts for ceasefire and peace talks.*
- **Nagorno-Karabakh War (2020):** Armenia, Azerbaijan, Russia.  
*Key Concepts: Conflict over Nagorno-Karabakh region, ceasefire agreement, role of Turkey, peace negotiations.*
- **Myanmar Civil War (2021-present):** Myanmar military (Tatmadaw), ethnic armed groups, and Civilian resistance.  
*Key Concepts: Coup aftermath, Rohingya crisis, ethnic conflicts, ASEAN mediation efforts.*

### UNIT IV: Sustainable Development Goals

- **Definition of Sustainable Development:** Balancing economic, social, and environmental needs.  
*Key Concepts: United Nations Development Programme (UNDP), World Wildlife Fund (WWF), Sustainable Development Solutions Network (SDSN).*
- **UN Sustainable Development Goals (SDGs):** Overview, targets.  
*Key Concepts: United Nations, national governments, NGOs, private sector.*
- **Challenges and Opportunities:** Achieving sustainability, global cooperation.  
*Key Concepts: United Nations, national governments, civil society organizations, multinational corporations.*

### UNIT V: India's Role in Achieving Sustainable Development Goals (SDGs) with Tamil Nadu Initiatives

#### Addressing Basic Needs:

- **Goal 1: No Poverty**

- National Rural Employment Guarantee Act (NREGA)
- Kalaigalar Kanchi Thalaisyalar Scheme
- Ungal Thozhil Udhayanam (UTOY)
- **Goal 2: Zero Hunger**
  - National Food Security Act (NFSA)
  - Nutritious Noon Meal Programme
  - Annadhanam Scheme
  - Amma Unavagam
- **Goal 3: Good Health and Well-being**
  - National Health Mission (NHM)
  - Health Insurance of Tamil Nadu
  - Chief Minister's Comprehensive Health Insurance Scheme
  - Maruthuva Mitri
  - Amma Mini Clinics

**Ensuring Essential Services:**

- **Goal 4: Quality Education**
  - Sarva Shiksha Abhiyan (SSA)
  - Rashtriya Madhyamik Shiksha Abhiyan (RMSA)
  - Namakkal District Library Scheme
  - Pudhumai Penn Scheme under Higher Education Assurance Scheme (HEAS)
  - Free Coaching for Competitive Exams
- **Goal 6: Clean Water and Sanitation**
  - Swachh Bharat Mission (Clean India Mission)
  - National Rural Drinking Water Programme (NRDWP)
  - Jal Jeevan Mission Tamil Nadu
  - Namakku Naatheey Scheme
  - Kudimaramathu Scheme
- **Goal 7: Affordable and Clean Energy**
  - National Solar Mission
  - Tamil Nadu Solar Energy Policy
  - Green House Scheme

**Building Sustainable Communities:**

- **Goal 11: Sustainable Cities and Communities**
  - Smart Cities Mission
  - Atal Mission for Rejuvenation and Urban Transformation (AMRUT)
  - Adi Dravidar Housing Scheme
- **Goal 13: Climate Action**
  - National Action Plan on Climate Change (NAPCC)
  - International Solar Alliance
  - Tamil Nadu Wind Energy Policy 2019
- **Goal 17: Partnerships for the Goals**
  - Development Assistance Programmes (DAPs)
  - International Development Cooperation (IDC)

**Question Paper Pattern: MCQ**