Annexure D

Parvatibai Chowgule College of Arts and Science (**Autonomous**)

Accredited by NAAC with Grade 'A+'
Best Affiliated College-Goa University Silver Jubilee Year Award

DEPARTMENT OF COMPUTER SCIENCE

PROPOSED STRUCTURE FOR SYBVoc

(To be offered to Students taking admission to 2nd Year BVoc from Academic Year 2023-24 Onwards)

	Semester		Course	Credits	Marks
Level -6 Skill Development Qualification Pack – **Application** **Developer - Web & Mobile** **(SSC/Q 8403)**	3	APPLICATION DEVELOPER WEB & MOBILE	Object Oriented Programming Using Java	6	150
			Computer Networks	6	150
			Server Side Programming	6	150
		GENERAL	Reasoning Technique *	4	100
			E-Commerce	4	100
			Mathematical foundation of Computer Science*	2	50
			Internship	2	50
			TOTAL	30	750
	4	APPLICATION DEVELOPER WEB & MOBILE	Software Engineering	6	150
			Web Development Framework	6	150
			Mobile Application Development	6	150
		GENERAL	Personality Development	4	100
			Creative Thinking*	2	50
			Advance Quantitative Technique*	4	100
			Internship	2	50
			Total	30	750

*New courses are introduced in the course structure

Summary Of Changes Incorporated In The Syllabus

Semester	Course title	Existing (indicate only the unit where the change is proposed)	Changes Proposed/new courses introduced	Specify the reason for the change
III	Reasoning Technique (General Component)	All the units	Syllabus Attached	EVS was already covered in the 1st Semester hence a addition of new Title was needed as per the NASSCOM Qualification pack **(SSC/Q8403)**
III	Mathematical foundation of Computer Science (General Component)	All the units	Syllabus Attached	This Title is reintroduced as there was a need for mathematical foundation for further topics in the later Semesters needed as per the NASSCOM Qualification pack **(SSC/Q8403)**
IV	Creative Thinking (General Component)	All the units	Syllabus Attached	Business Communication was already covered in the 1st Semester hence a addition of new Title was needed as per the NASSCOM Qualification pack **(SSC/Q8403)**
IV	Advance Quantitative Technique (General Component)	All the units	Syllabus Attached	This Title was added as per the NASSCOM Qualification pack **(SSC/Q8403)**

Course Title: Reasoning Techniques
Course Code: SD-G20
Credits: **4**
Marks: 100
Duration: 60

Prerequisite Courses : NIL

Course Objective
- □ To build logical and reasoning aptitude that is essential requirement in understanding various concepts and to solve problems effectively.

Course Learning Outcomes:
On successful completion of the course the students will

CLO1 : Create, solve and interpret basic data and logical models.

CLO2 : Make sound arguments based on reasoning and/or careful analysis of data.

CLO3 : Exhibit critical thinking by developing and expressing sound arguments from given premises to related conclusions

CLO4 : Effectively communicate the substance and meaning of logical problems and their solutions.

Syllabus:

Unit 1 [15 hrs]
Logic, Statements, Arguments, and Assumptions, Statements and Course of Action, Logical Venn Diagrams, Statements and Conclusions, Syllogism

Unit 2 [15 hrs]
Seating Arrangement, Ranking & Time Sequence Test, Blood Relations, Direction Sense Test, Conditions & Grouping, Simple & Coded Inequality, Decision Making, Clocks and Calendar, Situation Reaction Test

Unit 3 [15 hrs]
Decision-making, Judgment, Problem-solving, Analogies, Analysis, Differences, Discrimination Arithmetic series, Similarities, Verbal & figure classification, Space visualization, Observation Simple Problems on Data interpretation and Data sufficiency

Unit 4 [15 hrs]
Mathematical Logic: Introduction, Statements, Logical Connectives and Compound Statements: Negation, Conjunction, Disjunction, Implication, Converse and Inverse, logical Equivalence, Tautologies: Contradiction, Contingency, Algebra of Propositions, Argument, Predicate and Quantifiers.

REFERENCES

Mandatory Reading:
1. Arun Sharma, How to Prepare for Logical Reasoning for the CAT, 8th edition, McGraw Hill Education (India) Private Ltd.
2. A.K. Gupta, Logical and Analytical Reasoning, Ramesh Publishing House; 34th edition

3. Peeyush Bhardwaj, Analytical & Logical Reasoning for CAT & Other Management Entrance Tests, Arihant Publications; 4th edition
4. Rosen H. Kenneth, Discrete Mathematics and its Applications, Tata McGraw Hill, 7th edition

Supplementary Reading:
1. Ananta Ashisha, Data Interpretation & Data Sufficiency, Arihant Publications; Third edition
2. MK Pandey, Magical Book Series - Analytical Reasoning, BSC Publishing Co. Pvt. Ltd., 2017
3. Daniel kahneman, thinking fast and slow, Farrar, Straus and Giroux; Reprint edition
4. Dr. R.S. Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, 2018, S. Chand Publication

****

Course Title: Mathematical Foundation of Computer Science
Course Code: SD-G21
Credits: 2
Marks: 50
Duration : 30

Prerequisite Courses : NIL

Course Objectives:
☐ To build mathematical foundations that are essential requirements in understanding various concepts related to computer science.

Course Learning Outcomes:

CLO1: Gain knowledge in Propositions through the use of Logics.
CLO2: Demonstrate an understanding of relations and functions and determine their properties.
CLO3: Evaluate Boolean functions and simplify expressions using the properties of Boolean algebra.
CLO4: Write an argument using logical notation and determine if the argument is valid or not.

Syllabus:

Unit 1:   **[15 Hrs]**
Binary Numerical Systems, Matrix Operations and Basic Sets
1. Binary Number Systems:
Introduction to Boolean Number System, Decimal to binary conversion and vice versa, binary number representation (signed, 1's Complement and 2's Complement), binary addition and subtraction, binary to octal, hexadecimal conversion and vice versa, floating point representation.

2. Linear Algebra:
Introduction to Matrices and Linear Algebra, Adjacent, Inverse of a Matrix, Rank, Linear Equations, Characteristics roots and vertices.

3. Basics of Sets, Relations and Functions:
Introductions to sets, relations and functions, Venn diagram, set operations, relations and properties, closures, equivalence relations, partial ordering, function types, inverse of functions, composition of functions, recursive functions, growth functions.

Unit 2: [15 Hrs]
Boolean Systems and Operations

1. Boolean Algebra:
Introduction to Boolean Algebra, boolean functions, truth table, DeMorgan's theorem, logic gates, realization of boolean functions using logic gates, simplification using Karnaugh map.

2. Logic:
What is logic, propositional logic, first order logic, mathematical induction, deduction, proof by contradiction, program correctness.

REFERENCES

Mandatory Reading:
1. Rosen H. Kenneth, Discrete Mathematics and its Applications, Tata McGraw Hill, Seventh Edition, 2011.

Supplementary Reading:
1. Sarkar Kumar Swapan, A Textbook of Discrete Mathematics, S Chand & Company, 2005.

****

Course Title: Creative Thinking
Course Code: SD-G22
Credits: 2
Marks: 50
Duration: 30

Prerequisite Courses : NIL

Course Objective
□ This is a course on study of creative/lateral thinking and problem solving techniques those are essential to solve real world problems. Causal, deductive, and inductive arguments are described as well as the use of persuasion.

Course Learning Outcomes:
Upon completion of this course, students should be able to

CLO1: Identify the benefits of employing creative/lateral-thinking processes.

CLO2: Apply creative/lateral-thinking and problem-solving theories to real-world problems.

CLO3: Develop strategies to overcome the barriers that inhibit creative thinking.

CLO4: Identify strategies for creating an organizational culture that embraces and sustains creative-thinking practices

CLO5: Identify strategies to solve complex problems in a collaborative way.

CLO6: Apply creative/lateral-thinking principles to develop persuasive arguments that employ legal, moral, and aesthetic reasoning.

Syllabus

Unit 1   **[15 hrs]**

The way the mind works, Difference between lateral and vertical thinking, Attitudes towards lateral thinking, Basic nature of lateral thinking, The use of lateral thinking techniques, The generation of alternatives, Challenging assumptions, Innovation, Suspended judgment Design, Dominant ideas and crucial factors

Unit 2   **[15 hrs]**

Fractionation, The reversal method, Brainstorming Analogies, Choice of entry point and attention area, Random stimulation Concepts/divisions/polarization, The new word problem, Blocked by openness, Description/problem solving/design

REFERENCES

Mandatory Reading:
1. Edward De Bono, Lateral Thinking: Creativity Step by Step, Harper Perennial; Reissue edition (24 February 2015)
2. Ken Watanabe, Problem Solving 101: A simple book for smart people, Vermilion

Supplementary Reading:
1. R G Chaudhari, Training Techniques of Creative Problem Solving: Trainers Manual, Notion Press, Inc.; 1st edition
2. Mahon N, Basics Advertising 03: Ideation, AVA Publishing (October 26, 2011)
3. Brian Tracy, Creativity & Problem Solving: The Brian Tracy Success Library, Manjul Publishing House
4. Michael Sloan, The Art Of Problem Solving 101: Improve Your Critical Thinking And Decision Making Skills And Learn How To Solve Problems Creatively, Make Profits Easy LLC
5. Ruggiero, V. R., The art of thinking: A guide to critical and creative thought (11th ed.), Longman (2015).
6. Proctor, T., Creative Problem Solving for Managers: Developing Skills for Decision Making and Innovation, Routledge, 4th edition

****

Course Title: Advanced Quantitative Techniques
Course Code: SD-G23

Credits: 4
Marks: 100
Duration: 60

Prerequisite Courses: NIL

Course Objective
- □ To build mathematical foundation that is essential requirement in understanding various concepts.
- □ To understand appropriate statistical techniques for grouping, displaying, analyzing and interpreting statistical data

Course Learning Outcomes:
On successful completion of the course, the students will be able to

CLO1: Understand the basic principles of sets and operations in sets.

CLO2: Apply counting principles to determine probabilities.

CLO3: Demonstrate an understanding of matrices and determinants

CLO4: Apply basic statistical concepts & techniques for quantification of data.

CLO5: Independently calculate basic statistical parameters (measures of central tendency and dispersion, correlation and regression coefficients, indexes)

CLO6: Interpret the meaning of the calculated statistical indicators based on the acquired knowledge

Syllabus
Unit 1   **[15 Hrs]**
   Set, Relation, and Functions
   SETS: Sets, Subsets, Equal Sets, Universal Sets, Finite and Infinite Sets, Operation of Sets, Union, Intersection and Complement of sets, Cartesian product, Cardinality of Sets, Simple Applications.
   RELATION: Properties of Relation, Equivalence Relation
   FUNCTIONS: Domain and Range, Onto , Into and One-to One- Functions, Composite and Inverse functions, Hashing functions and Recursive Functions, growth of functions
Unit 2   **[15 Hrs]**
   Counting Principles
   Permutations; Combinations; Counting; Probability Summation; Basics of recurrence relations
   Matrices and Determinants
   Definition, Minors, Cofactors, Properties of Determinants MATRICES: Definition, Types of matrices, Multiplication of matrices, Adjoint, Inverse, Cramer's Rule, Rank of matrix, Dependence of vectors, Eigen vectors of a matrix
Unit 3   **[15 Hrs]**
   Statistical Sampling and Central Tendency
   Collection, classification, tabulation and presentation of data; the concept and methods of sampling, sample types Measures of central tendency **-** mean, median, mode, quartiles, deciles and percentiles and their applications in data analyses

Unit 4   **[15 Hrs]**
Measures of Dispersion and Relation

Measures of Dispersion- Range - Quartile Deviation – Mean Deviation - Standard Deviation. Coefficient of Variation Meaning and use of correlation – Types of correlation-Karl Pearson's correlation coefficient – Spearman's Rank correlation. Calculation of Correlation; Regression analysis, comparison between correlation and Regression – Regression Equations, Interpretation of Regression Co-efficients

Note: It is recommended to use excel/spreadsheets for Unit4 and Unit5

REFERENCES

Mandatory Reading:
1. Rosen H. Kenneth, Discrete Mathematics and its Applications, Tata McGraw Hill, 7th edition

2. Gupta. S. C. Fundamental of Statistics, Himalaya Publishing House, Mumbai, 6th edition

3. Kolman, Busby, Ross, Discrete Mathematical structures, Pearson

Supplementary Reading:
1. Sarkar Kumar Swapan, A Textbook of Discrete Mathematics, S Chand & Company, 2005.

2. J.K. Sharma, Discrete Mathematics, Macmillan India Ltd., Second Edition – 2005

3. Spiegel. M. R. and Stephens. J. L., Shaum's Outlines Statistics, Tata McGraw-Hill, India, 2011

4. Sanchetti D.C and Kapoor V.K .Statistics - Theory, Methods and Application, Sultan Chand & Sons , New Delhi, 7th edition, 2010.

****