BONAM VENKATA CHALAMAYYA ENGINERING COLLEGE
ODALAREVU – 533 210, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

DETAILED SYLLABUS FOR UG: B.Tech Computer Science and Engineering

II Year – I SEMESTER

S.No	Course Code	Courses	L	T	P	Credits
1	20BS3T03	Probability and Statistics	3	0	0	3
2	20CS3T02	Unified Modeling Language & DP	3	0	0	3
3	20CS3T03	Advanced Data Structures	3	0	0	3
4	20ES3T04	Python Programming	3	0	0	3
5	20CS3T05	Digital Logic Design	3	0	0	3
6	20CS3L06	Advanced Data Structures Lab	0	0	3	1.5
7	20ES3L07	Python & R Programming Lab	0	0	3	1.5
8	20CS3L08	Unified Modeling Language & DP Lab	0	0	3	1.5
9	20CS3S01	Employability Skills (Java Script/JSON)	1	0	2	2
MC	20BS3M03	Environmental Science	2	0	0	0
		Total	18	0	11	21.5

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II Year - I Semester

L T P C

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PROBABILITY AND STATISTICS
(Common to all Branches)

Subject code: 20BS3T03

Course Objectives:

COB 1: Know the importance of usage of Probability and Statistics.
COB 2: To help the students acquire a necessary base of Correlation, Quality Checking.
COB 3**:** Use R for statistical programming, computation, graphics, and modeling

Course Outcomes:

At the end of the course, student will be able to:

CO 1: Use the knowledge of Probability and Statistics in various situations. (L3)
CO 2: Analyze the concepts, Random variables and Probability distributions. (L4)
CO 3: Measure Correlation between variables and obtain lines of regression. (L5)
CO 4: Design quality control charts for quality checking. (L6)
CO 5: Use R for statistical programming, computation, graphics, and modeling. (L3)
CO 6: Classify Functions and use R in an efficient way. (L4)

UNIT I:-Introduction to Probability and Statistics

Probability-Addition law of Probability-Independent Events-Conditional Probability-Bayes Theorem (with out proof).

Statistics-Measures of Central Tendency-mean, mode, median, Measures of Dispersion-Variance, standard deviation, Skewness, Kurtosis.

UNIT II:-Random variables and Distributions

Introduction- Random variables- Distribution function- Discrete distributions (Binomial and Poisson distributions only) Continuous distributions: Normal, Normal approximation to Binomial distribution, Gamma and Weibull distributions.

UNIT III: - Curve fitting and Correlation

Introduction - Fitting a straight line –Second degree curve-exponential curve - power curve by method of least squares, Simple Correlation and Regression

UNIT IV: - Statistical Quality Control Methods

Introduction - Methods for preparing control charts – Problems using $\bar{x}$, p, R charts and attribute charts

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UNIT V: - Introduction of R

Basic Math, Variables, Data Types, Vectors, Arrays , Lists, Data Frames Matrices, , Classes**.** R Programming Structures, Control Statements, Loops, - Looping Over Non vector Sets,If-Else, Arithmetic and Boolean Operators and values. Math Function Extended Example Functions Sorting, Linear Algebra Operation on Vectors and Matrices. Graphics, Creating Graphs, Histogram, the plot() Function – Customizing Graphs, Saving Graphs to Files. Regression. Create R Pie, Bar Charts using R, Create Histogram and Line graph, Calculate mean, median and mode using R Analyze Linear Regression using R.

Text Books:

1. **B.S.GREWAL,** Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **N.P.Bali**, Engineering Mathematics, Lakshmi Publications.
3. Probability and Statistics, **Dr T K V Iyengar**, **Dr B.Krishna Gandhi**, **S.Ranhanatham** and Dr. **M.V.S.S.N Prasad**, S.Chand & Company Ltd.
4. The Art of R Programming, **Norman Matloff**, Cengage Leaning
5. R for Everyone, **Lander**, Pearson

Reference Books:

1. Fundamentals of Mathematical Statistics, **S.C .Gupta , V.K .Kapoor**, S.Chand & Company Ltd
2. **B.V.Ramana**, Engineering Mathematics: 4th Edition, Tata McGraw Hill, 2009, New Delhi
3. **ERWIN KREYSZIG,** Advanced Engineering Mathematics, 10th Edition, Wiley-India
4. R Cookbook, **PaulTeetor, Oreilly**.
5. R in Action, **Rob Kabacoff**, Manning

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UNIFIED MODELING LANGUAGE & DESIGN PATTERNS

Course code:20CS3T02 II Year-I SEMESTER

UNIT-I: Introduction to OOAD, Model, Conceptual Model of UML, Architecture, Classes, Relationships, Common Mechanisms, Class diagram, Object diagram, interaction diagram, usecase diagram and activity diagrams, typical activities/ workflows/disciplines in OOAD, Introduction to iterative development and the Unified Process, Introduction to UML; mapping disciplines to UML artifacts, Introduction to Design Patterns-goals of a good design, Introducing a case study & MVC architecture.

UNIT-II:
Inception: Artifacts in inception, Understanding requirements- the FURPS model, Understanding Use case model - introduction, use case types and formats, Writing use cases- goals and scope of a use case, elements/sections of a use case, Use case diagrams, Use cases in the UP context and UP artifacts, Identifying additional requirements, Writing requirements for the case study in the use case model.
UNIT- III

Elaboration: System sequence diagrams for use case model, Domain model: identifying concepts, adding associations, adding attributes, Interaction Diagrams, Introduction to GRASP design Patterns, Design Model: Use case realizations with GRASP patterns, Design Class diagrams in each MVC layer, Mapping Design to Code, Design class diagrams for case study and skeleton code.

UNIT-IV:
Fabrication, Indirection, Singleton, Factory, Facade, Publish-Subscribe.

UNIT-V:
State-Chart diagrams, Activity diagrams, Component Diagrams, Deployment diagrams, Object Diagrams, Advanced concepts in OOCD: Use case relationships, Generalizations Domain Model refinements, Architecture, Packaging model elements.

Textbooks:
1. Applying UML and patterns' by Craig Larman, Pearson
2. Object-Oriented Analysis& Design with the Unified Process by Satzinger, Jackson& Burd Cengage Learning.
3. UML distilled by Martin Fowler, Addison Wesley, 2003
4 The Unified Modeling Language User Guide Grady Booch, J Rumbaugh, I Bar Jacobson 12 impression 2012 Pearson
Reference Books:
1. O'reilly's Head-First Design Patterns' by Eric Free man et al, Oreilly
2. UML2 Toolkit, by Hans- Erik Eriksson, MagnusPenker, Briani yons,DavidFado: WILEY-DreamtechindiaPvt.Lid.

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ADVANCED DATA STRUCTURES

II Year-I SEMESTER **Course Code:20CS3T03**

Objectives:

Exposed to hashing approaches, variants of trees, heaps, queues. implementation of graph algorithms, analysis of sorting algorithms with respect to bounds and file organizations and operations

UNIT:I

Objectives: Comprehensive understanding of dictionaries, hashing mechanism which supports faster retrieval and skip lists. Dictionaries: Sets, Dictionaries, Hash Tables, Open Hashing. Closed Hashing (Rehashing Methods), Hashing Functions Division Method, Multiplication Method, Universal Hashing, Skip Lists, Analysis of Skip Lists (Reference 1)

UNIT II:

Objectives: Illustration of Balanced trees and their operations, AVL Trees: Maximum Height of AVL Tree, Insertions and Deletions, 2-3 Trees: Insertion, Deletion.

UNIT III:

Objectives: Comprehension of heaps, queues and their operations Priority Queues Binary Heaps: Implementation of Insert and Delete min, Creating Heap Binomial Queues: Binomial Queue Operations, Binomial Amortized Analysis, Lazy Binomial Queues

UNIT IV:

Objectives: Detailed knowledge of nonlinear data structures and various algorithms, Graph algorithms: Minimum-Cost Spanning Trees Prim's Algorithm, Kruskal's, Algorithm Shortest Path Algorithms: Dijkstra's Algorithm, All Pairs Shortest Paths Problem: Floyd's Algorithm, Warshall's Algorithm,

UNIT V:

Objectives: Analysis of complexities in various sorting techniques along with their lower bounds Sorting Methods: Order Statistics: Lower Bound on Complexity for Sorting Methods: Lower Bound on Worst Case Complexity, Lower Bound on Average Case Complexity, Heap Sort. Quick Sort, Radix Sorting, Merge Sort; Objectives: Illustration of tries which share some properties of table look up, various issues related to the design of file structures Pattern matching and Tries: Pattern matching algorithms- the Boyer -Moore algorithm, the Knuth-Morris-Pratt algorithm Tries: Definitions and concepts of digital search tree, Binary trie. Patricia. Multi-way tries.

Note: (NON RECURSIVE IMPLEMENTATION For All Topics)

Text Books:

1. Data Structures, A Pseudo code Approach, Richard F Gilberg, Behrouz A Forouzan, Cengage
2. Fundamentals of DATA STRUCTURES in C: 2nd ed., Horowitz, Sahani, Anderson-freed, Universities Press 1.
3. Data structures and Algorithm Analysis in C, 2nd edition, Mark Allen Weiss, Pearson
4. Advanced Data Structures 1" Edition by Reema Thereja & Rama Shree, OXFORD

Reference Books:

1. File Structures :An Object oriented approach with C++, 3rd ed. Michel J Folk, Greg Riccardi, Bill Zoellick 2. C and Data Structures: A Snap Shot oriented Treatise with Live examples from Science and Engineering, NB Venkateswarlu & EV Prasad, S Chand, 2010.

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II Year – I SEMESTER

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3	0	0	3

PYTHON PROGRAMMING

Course Code:20ES3T04

Course Objectives:

- This course introduces core programming basics—including data types, control structures, program design with functions—via the Python programming language.
- The course discusses the fundamental principles of Object-Oriented Programming, as well as in-depth data and information processing techniques.
- Students will solve problems, explore real-world software development challenges, and create practical and contemporary applications.

UNIT I:

OVERVIEW: History of Python, Python Feature, Installing Python, Setting up PATH, Setting path at Unix/Linux, Setting path at Windows, Running Python scripts

BASIC SYNTAX: First Python Program, Python Identifiers, Python Keywords, Lines and Indentation, Multi-Line Statements, Quotation in Python

UNIT II:

VARIABLE TYPES: Assigning Values to Variables, Multiple Assignment, Standard Data Types, Data Type Conversion

BASIC OPERATORS: Types of Operators, Python Arithmetic Operators, Python Comparison Operators, Python Assignment Operators, Python Bitwise Operators, Python Logical Operators, Python Membership Operators , Python Identity Operators, Python Operators Precedence

UNIT III:

DECISION MAKING: If Statement, If…else Statement, The *elif* Statement

LOOPS: While Loop, The Infinite Loop, Using else Statement with Loops, For Loop, Iterating by Sequence Index, Using else Statement with Loops, Nested Loops.

Loop Control Statements: Break Statement, Continue Statement, Pass Statement

UNIT IV:

Data Structures: Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Strings and Comprehensions.

UNIT V:

FUNCTIONS: Defining a Function, Calling a Function, Passing by Reference versus Passing by Value, Function Arguments, Required Arguments, Keyword Arguments, Default Arguments, Variable Length Arguments, The Anonymous Functions, The return Statement, Scope of Variables, Global vs. Local variables

CLASSES AND OBJECTS: Overview of OOP Terminology, Creating Classes, Creating Instance Objects, Accessing Attributes, Built-In Class Attributes, Destroying Objects (Garbage Collection), Class Inheritance**; Exceptions:** What is an exception, Handling exceptions, The **except** clause with No Exceptions, The **except** clause with multiple exceptions, The try-finally clause, arguments of an exception, raising an exception, user defined exceptions.

OUTCOMES:

- Master an understanding of scripting and the contributions of scripting languages.
- Master an understanding of Python especially the object oriented concepts.
- Master an understanding of the built-in objects of python
- Experience with an interpreted Language.
- To build software for real needs.

TEXT BOOKS:

1. Python Programming, A Modern approach vamsi kurama, Pearson
2. Python Programming by Reema Thereja 1st Edition by OXFORD
3. Python Programming, Ashok Namdev Kamthane, Amit Ashok Kamthane.

REFERENCE BOOK:

1. Python Programming, CH Satyanaraya, M Radhika Mani, B N Jagadeesh
2. Fundamentals of Python, KENNETH A.LAMBERT, B L JUNEJA
3. Python Programming, K Nageswara Rao, Shaik Akbar

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II Year – I SEMESTER

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DIGITAL LOGIC DESIGN

Course Code:20CS3T05

OBJECTIVE:

- To introduce the basic tools for design with combinational and sequential digital logic and state machines.
- To learn simple digital circuits in preparation for computer engineering.

UNIT I:

Number Systems

Binary, Octal, Decimal, Hexadecimal Number Systems. Conversion of Numbers From One Radix To Another Radix,r's Complement and(r-1)'s Complement Subtraction of Unsigned Numbers, Problems, Signed Binary Numbers, Weighted and Non weighted codes

UNITII:

Logic Gates and Boolean Algebra

Basic Gates NOT, AND, OR, Boolean Theorems, Complement And Dual of Logical Expressions, Universal Gates, Ex-Or And Ex-or Gates, SOP, POS, Minimizations of Logic Functions Using Boolean Theorems.

UNIT III:

Gate Level Minimization: Karnaugh Map Method (K-Map): Minimization of Boolean Functions maximum up to Four Variables, POS and SOP, Simplifications withDon't care conditions Using K-Map, NAND and NOR Implementation.

UNIT IV:

Combinational Logic Circuits

Design of Half Adder, Full Adder, Half Subtractor, Full Subtractor, Ripple Adders and Subtractor, Design of Decoders, Encoders, Multiplexers, Priority Encoder, Code Converters.

UNIT V:

Introduction to Sequential Logic Circuits

Classification of Sequential Circuits, Basic Sequential Logic Circuits: Latch and Flip-Flop, RS-Latch Using NAND and NOR Gates, Truth Tables. RS, JK, T and D FlipFlops, Truth and Excitation Tables, Conversion of FlipFlops. FlipFlops with Asynchronous Inputs (Preset and Clear).

Registers and Counters

Design of Registers, Buffer Register, Control Buffer Registers, Bidirectional Shift Registers, Universal Shift Register, Design of Ripple Counters, Ring Counter, Johnson Counter.

OUTCOMES:

- A student who successfully fulfills the course requirements will have demonstrated:
- An ability to define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.
- An ability to understand the different switching algebra theorems and apply them for logic functions.
- An ability to define the Karnaugh map for a few variables and perform an algorithmic reduction of logic functions.
- An ability to define the other minimization methods for any number of variables Variable Entered Mapping (VEM) and Quine-MeCluskey (QM) Techniques and perform an algorithmic reduction of logic functions.

TEXT BOOKS:

1. Digital Design, 5/e, M.Morris Mano, Michael D Ciletti, PEA.
2. Fundamentals of Logic Design, 5/e, Roth, Cengage.

REFERENCE BOOKS:

1. Digital Logic and Computer Design, M.Morris Mano, PEA.
2. Digital Logic Design, Leach, Malvino, Saha, TMH.
3. Modern Digital Electronics, R.P. Jain, TMH.

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II Year-I SEMESTER **Course Code:20CS3106**

ADVANCED DATA STRUCTURES LAB

1. To implement functions of Dictionary using Hashing (division method, Multiplication method, Universal hashing)
2. To perform various operations ie, insertions and deletions on AVL trees
3. To perform various operations ie, insertions and deletions on 2-3 trees
4. To implement operations on binary heap.
5. To implement operations on graphs

a) vertex insertion b)Vertex deletion c)finding vertex d)Edge addition and deletion

6. To implement Depth First Search for a graph non recursively.
7. To implement Breadth First Search for a graph non recursively.
8. To implement Prim's algorithm to generate a min-cost spanning tree.
9. To implement Krushkal's algorithm to generate a min-cost spanning tree
10. To implement Dijkstra's algorithm to find shortest path in the graph
11. To implement pattern matching using Boyer-Moore algorithm.
12. To implement Knuth-Morris-Pratt algorithm for pattern matching.

II Year – I SEMESTER

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Python and R Programming Lab: 20ES3L07

Python Programming

Week 1

Exercise 1 – Basics of Python Programming

a) Running instructions in Interactive interpreter and a Python Script

b) Write a program to purposefully raise Indentation Error and Correct it

Exercise 2 - Operations

a) Write a program to compute distance between two points taking input from the user (Pythagorean Theorem)

b) Write a program add.py that takes 2 numbers as command line arguments and prints its sum.

Week 2

Exercise - 3 Control Flow

a) Write a Program for checking whether the given number is a even number or not.

b) Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . . 1/10

c) Write a program using a for loop that loops over a sequence. What is sequence?

d) Write a program using a while loop that asks the user for a number, and prints a count down from that number to zero.

Exercise 4 - Control Flow - Continued

a) Find the sum of all the primes below two million.

Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be: 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, .

b) By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms.

Exercise - 5 - DS

a) Write a program to count the numbers of characters in the string and store them in a dictionary data structure

b) Write a program to use split and join methods in the string and trace a birthday with a dictionary data structure.

Exercise - 6 Files

a) Write a program to print each line of a file in reverse order.

b) Write a program to compute the number of characters, words and lines in a file.

Exercise - 7 Functions

a) Write a function ball collide that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding.

b) Find mean, median, mode for the given set of numbers in a list.

Exercise - 8 Functions - Continued

a) Write a function nearly_equal to test whether two strings are nearly equal. Two strings a and bare nearly equal when a can be generated by a single mutation on b.

b) Write a function dups to find all duplicates in the list.

c) Write a function unique to find all the unique elements of a list.

R-programming Laboratory:

1. --Install and run R Program on RScript
2. Create vector. List, Array , matrix using R
3. Factor, Data Frames in R
4. Variable assignment in R Finding variable and removing them
5. Arithmetic Operators
6. R Decision making and Loop
7. Functions in R
8. Create, access and manipulate vector in R
9. Create, access and manipulate List in R
10. Create, access and make Matrix computations in R
11. Create, access and manipulate Array in R
12. Create R Pie, Bar Charts using R
13. Create Histogram and Line graph
14. Calculate mean, median and mode using R
15. Analyze Linear Regression using R

II Year-I SEMESTER **Course Code: 20CS3L08**

UML & DESIGN PATTERNS LAB

Take three case studies:

1.Customer Support System (in the Object-Oriented Analysis & Design with the unified Process by Satzinger, Jackson & Burd Cengage Learning)
2 Point-Of-Sale Terminal (in Larman textbook)
3. Library Management System (in the reference book no, 2 Le. UML. toolkit)

Week 1:

Familiarization with Rational Rose or Umbrello
For each case study:

Week 2, 3 & 4:

For each case study:
a) Identify and analyze events b) Identify Use cases c) Develop event table d) Identify & analyze domain classes e) Represent use cases and a domain class diagram using Rational Rose f) Develop CRUD matrix to represent relationships between use case and problem domain classes.

Week 5 & 6:

For each case study:

a) Develop use case diagrams b) Develop elaborate use case descriptions and scenarios c) Develop Prototypes (without functionality) d) Develop system sequence diagrams.

Week 7,8,9 and 10:

For each case study:
a)Develop high level sequence diagrams for each use case.
b) Identify MVC classes/Objects for each use case
c) Develop detailed sequence diagrams/communication diagrams for each use case showing interactions among all the three layer objects.
d) Develop detailed design class model (use GRASP patterns for responsibility assignment)..
e) Develop three layer package diagrams for each case study.

Week 11 & 12:

a)Develop Use case Packages
b)Develop component diagrams
c) Identify relationships between use cases and represent them
d) Refine domain class model by showing all the associations among classes.

Week 13 onwards:

For each case study:

a) Develop sample diagrams for other UML diagrams state chart diagrams, activity diagrams and deployment diagrams

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II Year – I SEMESTER

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EMPLOYABILITY SKILLS : Java Script

Course Code: 20CS3S01

Unit I

An introduction: An Introduction to JavaScript,Code editors, Developer console JavaScript Fundamentals: Hello, world!, Code structure, Variables, Data types, Interaction: alert, prompt, confirm, Type Conversions

Unit II

Basic operators, maths, Comparisons, Conditional branching: if, '?', Logical operators, Loops: while and for The "switch" statement

Unit III

Functions, Function expressions, Arrow functions, the basics JavaScript specials

Unit IV

Objects: the basics: Objects, Number, Boolean, Strings, Math, Reg Exp, HTML DOM Date and time.

Unit V

JSON

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II Year – I SEMESTER

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2	0	0	0

ENVIRONMENTAL SCIENCE

Course Code: 20BS3M03

Unit 1:
The Multidisciplinary nature of environmental studies Definition, scope and importance, Eco systems, Concept of an eco system, Structure and function of an eco system. Producers, consumers, decomposers, Ecological succession, Food chains, food webs and ecological pyramids. Structure and function of the following eco systems: Forest ecosystem, Grass land ecosystem

Unit 2:
Natural Resources: Renewable and non renewable resources: a) Natural resources and associated problems, Forest resources, Water resources Mineral Resources, Food Resources Energy Resource, Land Resources; b) Role of individual in conservation of natural resources.

UNIT 3:
Biodiversity and it's Conservation: Introduction-Definition: genetics, species and ecosystem diversity, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, India as a mega diversity nation, Hot-spots of biodiversity, Threats to biodiversity: habitats loss, poaching of wild life, man wildlife conflicts., Endangered and endemic spaces of India, Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

UNIT 4:
Environmental Pollution: Definition, Causes, effects and control measures of air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution, nuclear hazards. Solid waste management: Causes, effects and control measures of urban and industrial waste. Role of an individual in prevention of pollution. Pollution case studies.

UNIT 5:
Social issues and environment: Water conversation and rain water harvesting, Resettlement and rehabilitation of people; its problems and concerns, case studies, Climate change, global warming, acid rain, ozone layer depletion, case studies, consumerism and waste products, Environment protection act, Air (prevention control of pollution) act, Water (prevention control of pollution) act, Wildlife protection act, Forest conversation act, population growth..

Field Work:
Visit to local are to document environment assets river/forecast/grassland/hills/mountain. Visit to local polluted site – urban/rural/industrial/agricultural. Study of common plants, insects, birds. Study of simple eco-systems-pond, river.
Recommended Books:

1. Text Book of Environmental Studies, Erach Bharucha, UGC.
2. Fundamental Concepts in Environmental Studies, D D Mishra, S Chand & Co Ltd.