SHRI VENKATESHWARA UNIVERSITY

Syllabus
Diploma

(Computer Science)

III SEMESTER
(Three Years Programme)

(w.e.f. 2019-20)

SCHOOL OF ENGINEERING & TECHNOLOGY

SEMESTER- III

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
		Computer Science **III SEMESTE**											
			L	T	P	C T	T A	Total	P S	TE	P E		
1	**PCS - 301**	Computer Programming	2	0	0	20	10	30		70		100	2
2	**PCS-302**	Scripting Languages	2	0	0	20	10	30		70		100	2
3	**PCS-303**	Data Structures	2	0	0	20	10	30		70		100	2
4	**PCS - 304**	Computer System Organisation	3	1	0	20	10	30		70		100	4
5	**PCS-305**	Algorithms	**3**	**1**	**0**	20	10	30		70		100	**4**
6	**PCS -311**	Computer Programming Lab	0	0	4				10		15	25	2
7	**PCS -312**	Scripting Languages Lab	0	0	4				10		15	25	2
8	**PCS -313**	Data Structures Lab	0	0	2				10		15	25	1
9	**PCS -314**	Summer Internship-1	0	0	4				50			50	2
												625	**21**

Course Code	PCS-305
Course Title	Algorithms
Number of Credits	4 (L: 3, T: 1, P: 0)

Course Learning Objectives:

The objective of this course is to prepare the student with the algorithmic foundations of computing. A sound grasp of algorithms is essential for any computer science engineer. Almost all programming involves algorithms at some level.

Course Content:

UNIT 1: Fundamentals

Programming Models. Data Abstraction. Sets, Multisets, Stacks, Queues. Asymptotic and worst-case analysis of algorithms.

UNIT 2: Sorting

The sorting problem. Bubble sort, Selection sort, Insertion sort, Mergesort, Quicksort.

UNIT 3: Searching

Symbol Tables, Binary Search Trees, Balanced Search Trees. Hash Tables.

UNIT 4: Graphs

Definition of a directed and undirected graph. Paths, Cycles, spanning trees. Directed Acyclic Graphs. Topological Sorting. Minimum Spanning Tree algorithms. Shortest Path algorithms: Dijkstra's algo- rithm. Flow-based algorithms.

UNIT 5: Strings

String Sort. Tries. Substring Search. Regular Expressions. Elementary Data compression.

Reference Books:

1. Algorithms, Sedgewick and Wayne, Pearson
2. Introduction to Algorithms, Cormen, Leiserson, Rivest and Stein. MIT Press
3. Introduction to Theory of Computation, Sipser Michael, Cengage Learnng.
4. Design & Analysis of Algorithms, Gajendra Sharma, Khanna Publishing House

Course outcomes:

The student should be able to design basic algorithms for sorting and searching. The student should be able to understand the basic notions of time and space complexity of algorithms. The student should be able to implement sorting, searching, tree and graph algorithms in a modern computer programming language.

Course Code	PCS-305
Course Title	Computer Networks
Number of Credits	2 (L: 2, T: 0, P: 0)

Course Learning Objectives:

Understand functioning of computer networks and popular networking protocols

Course Content:

UNIT 1:

Introduction to computer networks; Network Models- OSI Reference Model, TCP/IP Model;

UNIT 2:

Transmission Media – principles, issues and examples; Wired Media – Coaxial, UTP, STP, Fiber Optic Cables; Wireless Media – HF, VHF, UHF, Microwave, Ku Band; Network topologies; Data Link Layer – design issues, example protocols (Ethernet, WLAN, Bluetooth); Switching Techniques;

UNIT 3:

Network Layer - design issues, example protocols (IPv4); Routing - principles/issues, algorithms
(Distance-vector, Link-state) and protocols (RIP, OSPF);

UNIT 4:

Transport Layer - design issues, example protocols (TCP); Application Layer Protocols (SMTP, DNS).

UNIT 5:

Functioning of Network Devices – NIC, Hub, Switch, Router, WiFi Devices; Network Management
System and example protocol (SNMP).

Reference Books:

1. Computer Networks, 4th Edition (or later), Andrew S. Tanenbaum, PHI
2. TCP/IP Illustrated, Volume-1, W. Richard Stevens, Addision Wesley
3. Data and Computer Communications, William Stallings, PHI
4. An Engineering Approach to Computer Networking, S. Keshav, Addision Wesley/Pearson
5. An Integrated Approach to Computer Networks, Bhavneet Sidhu, Khanna Publishing House

Course outcomes:

1. Understanding of computer networks, issues, limitations, options available.
2. Understanding of the care that needs to be taken while developing applications designed to work over computer networks
3. Able to configure basic LAN and connect computers to it.

Course Code	PCS-301
Course Title	Computer Programming
Number of Credits	2 (L: 2, T: 0, P: 0)

Course Learning Objectives:

To enable student, develop structured solutions to problems and implementing them using comput- ers. This involves two parts: i) Formulating a solution for a given problem as a well-defined sequence of actions, and ii) Expressing solution in a machine readable form or a programming language. For the second part, we will learn the common units of programming languages. The first part can only be learned through the repeated practice of solving problems.

Course Content:

The language of choice will be C. The focus will be on problem solving and problem where these ideas can be applied. The main focus of the class will to take examples of problems where these ideas can be employed.

UNIT 1:

Introduction to Problem Solving (computational way of thinking); Variables and Representation

UNIT 2:

Arithmetic, Relational, Logical and Bitwise Operators; Input, Output, Formatting and File I/O

UNIT 3:

Conditional Statements, Repeat Statements, Loops and Nested Loops

UNIT 4:

Arrays and Memory Organization, Strings, Multidimensional Arrays, Functions and Parameter Pass- ing

UNIT 5:

Recursion and Recursive solutions

Suggested Lab Work:

This is a skill course. Topics/concepts taught in the class should be practiced in the Lab same week and practiced regularly during the semester till student becomes confident about it. Students should work on solved and unsolved problems listed in the text books. Teacher also should formulate prob- lems and give them as assignment. This course is all about some theory and a lot of practice.

Reference Books:

1. Let Us C, Yashavant Kanetkar
2. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House
3. C Programming Absolute Beginner's Guide, Dean Miller and Greg Perry
4. The C Programming Language, Kernighan and Ritchie, Prentice Hall of India
5. Programming in ANSI C, E. Balagurusamy, Tata McGraw-Hill
6. C Programming & Data Structures, B. A. Fouruzan and R. F. Gilberg, CENGAGE Learning.

Course Code	PCS-304
Course Title	Computer System Organization
Number of Credits	4 (L: 3, T: 1, P: 0)

Course Learning Objectives:

To have a thorough understanding of the basic structure and operation of a digital computer, its ar- chitectures and computational designs.

Course Content:

UNIT 1:

Structure of Computers: Computer Functional units, Von-Neumann architecture, Bus structures, Ba-
sic Operational Concepts, Data representation (Fixed and Floating point), Error detecting codes.

Register Transfer and Micro Operations: Register transfer, Bus and memory transfers, Arithmetic micro-operations, Logic micro-operations, Shift micro-operations, and Arithmetic logic shift unit.

UNIT 2:

Micro Programmed Control: Control memory, Address sequencing, and design of control unit.

Computer Arithmetic: Addition and Subtraction, Multiplication and Division algorithms, Float- ing-point arithmetic operation, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline Vector Pro- cessing, Array Processors.

UNIT 3:

Introduction to Microproccessor Architecture: Instruction Set Architecture design principles from
programmer's perspective. One example microprocessor (Intel, ARM, etc).

UNIT 4:

Assembly Language Programming: Simple programs, Assembly language programs involving logical, branch and call instructions, sorting, evaluation of arithmetic expressions, string manipulation, as- sembler directives, procedures and macros.

UNIT 5:

Memory and Digital Interfacing: addressing and address decoding, interfacing RAM, ROM, EPROM, programmable peripheral interface, various modes of operation and interfacing to processor, inter- facing keyboard, displays, etc.

Reference Books:

1. Computer System Architecture, M. Moris Mano, Pearson/PHI, India.
2. Microprocessors Interface, Douglas V.Hall, Tata McGraw-Hill.
3. Computer Organization, Carl Hamacher, Zvonks Vranesic, SafeaZaky, McGraw-Hill
4. Advanced Microprocessors and Peripherals- Architecture, Programming and interfacing, A.K.Ray, K.M.Bhurchandi, Tata McGraw- Hill, New Delhi, India.
5. Computer Organization and Design: A Hardwar/Software Interface

(MIPS Edition) by Patterson and Hennessy

Course outcomes:

Have a good understanding of functioning of computer system as such and its various subcompo- nents. Student will be able to understand computing requirement for a specific purpose, analyse performance bottlenecks of the computing device and choose appropriate computing device for a given use case.

Course Code	PCS-303
Course Title	Data Structures
Number of Credits	2 (L: 2, T: 0, P: 0)

Course Learning Objectives:

To provide strong foundation for implementing programming language to formulate, analyze and develop solutions related to various data structures problems.

Course Content:

UNIT 1:

Introduction to Data Structures: Basic Terminology, Classification of Data Structures, Operations on

Data Structures.

UNIT 2:

Linear Data Structures- Stacks: Introduction to Stacks, Array Representation of Stacks, Operations on

a Stack, Applications of Stacks-Infix-to-Postfix Transformation, evaluating Postfix Expressions.

Queues: Introduction to Queues, Array Representation of Queues, Operations on a Queue, Types of Queues-DeQueue, Circular Queue, Applications of Queues-Round Robin Algorithm.

UNIT 3:

Linked Lists: Singly Linked List, Representation in Memory, Operations on a Single Linked List, Cir- cular Linked Lists, Doubly Linked Lists, Linked List Representation and Operations of Stack, Linked List Representation and Operations of Queue.

UNIT 4:

Non Linear Data Structures - Trees: Basic Terminologies, Definition and Concepts of Binary Trees, Representations of a Binary Tree using Arrays and Linked Lists, Operations on a Binary Tree-Inser- tion, Deletion, Traversals, Types of Binary Trees.

GRAPHS: Graph Terminologies, Representation of Graphs- Set, Linked, Matrix, Graph Traversals

Suggested Lab Work:

This is a skill course. Topics/concepts taught in the class should be practiced in the Lab same week and practiced regularly during the semester till student becomes confident about it. Students should work on solved and unsolved problems listed in the text books. Teacher also should formulate prob- lems and give them as assignment. This course is all about some theory and a lot of practice.

This course is linked with a previous course on Computer Programming and a parallel course on

Algorithms, hence exercises should not be done in isolation.

Reference Books:

1. Data Structures, R.S. Salaria, Khanna Book Publishing, New Delhi
2. Data Structures Using C, Reema Thareja, Oxford University Press India.
3. Classic Data Structures, Samanta Debasis, Prentice Hall of India.
4. Fundamentals of Data Structure in C, Horowitz, Ellis, Sahni, Sartaj, Anderson-Freed, Susan, University Press, India.
5. Data Structures: A Pseudo code approach with C, Richard F. Gilberg, Behrouz A. Forouzan, CENGAGE Learning, India.
6. Data Structures and Algorithms: Concepts, Techniques and Applications, G. A. V. Pai, McGraw- Hill Education, India.

Course outcomes:

Have a good understanding of Data Structures and its applications in algorithms.

Course Code	PCS-
Course Title	Introduction to DBMS
Number of Credits	2 (L: 2, T: 0, P: 0)

Course Learning Objectives:

It covers the development of database-driven applications using the capabilities provided by modern database management system software. The concepts include conceptual modeling, relational database design and database query languages.

Course Content:

As a part of the lab, project work is included.

UNIT 1:

Introduction; Database System Concepts and Architecture

UNIT 2 :

Data Modeling using the Entity-Relationship Model; The Enhanced Entity-Relationship (EER) model

UNIT 3:

The Relational Data Model and Relational Database Constraints; ER/EER to Relational Model map- ping; Relational Algebra and Relational Calculus

UNIT 4:

SQL-99: Schema definition, Constraints, Queries, and Views; Security; Introduction to SQL program- ming Techniques

UNIT 5:

Functional dependencies and normalization for relational databases; Relational database design al- gorithms and further dependencies.

Reference Books:

1. Fundamentals of Database Systems, Elmasri & Navathe, Pearson Education
2. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata McGraw-Hill.
3. Database System Concepts, Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw- Hill, New Delhi, India.
4. Introduction to Database Systems, C.J.Date, Pearson Education
5. Introduction to SQL, Rick F.Vander Lans, Pearson Education

Course outcomes:

After completing the course, the students will understand (i) how to design a database, database-based applications (ii) How to use a DBMS (iii) the critical role of database system in designing several information system-based software systems or applications.

Course Code	PCS-
Course Title	Operating Systems
Number of Credits	2 (L: 2, T: 0, P: 0)

Course Learning Objectives:

A general introduction to various ideas in implementation of operating systems, particularly UNIX. Introduce to various options available so as to develop capacity to compare, contrast, and evaluate the key trade-offs between different design choices.

Course Content:

UNIT 1:

Overview of Operating System, basic concepts, UNIX/LINUX Architecture, Kernel, services and sys- tems calls, system programs.

UNIT 2:

Process Management: Process concepts, operations on processes, IPC, Process Scheduling, Multi- threaded programming

Memory management: Memory allocation, Swapping, Paging, Segmentation, Virtual Memory, vari- ous faults.

UNIT 3:

File management: Concept of a file, access methods, directory structure, file system mounting, file sharing and protection, file system structure and implementation, directory implementation, free- space management, efficiency and performance. Different types of file systems

UNIT 4:

I/O System: Mass storage structure - overview, disk structure, disk attachment, disk scheduling algo- rithms, swap space management, RAID types.

UNIT 5:

OS Security: Authentication, Access Control, Access Rights, System Logs

Reference Books:

1. Operating System Concepts, Silberschatz and Galvin, Wiley India Limited
2. UNIX Concepts and Applications, Sumitabha Das, McGraw-Hill Education
3. Operating Systems, Internals and Design Principles, Stallings, Pearson Education, India
4. Operating System Concepts, Ekta Walia, Khanna Publishing House
5. Modern Operating Systems, Andrew S. Tanenbaum, Prentice Hall of India
6. Operating systems, Deitel & Deitel, Pearson Education, India

Course outcomes:

Students should be able to demonstrate basic knowledge about Operating System, be able to apply OS concepts such as processes, memory and file systems to system design, able to configure OS in an efficient and secure manner.

Course Code	PCS-302
Course Title	Scripting Languages
Number of Credits	2 (L: 2, T: 0, P: 0)

Course Learning Objectives:

To learn how to work with a scripting language.

Course Content:

UNIT 1: Introduction, Variables and Data Types

History, Features, Setting up path, Installation and Working with Perl/Python, Basic Syntax

Understanding Perl/Python variables, Numeric data types, Using string data type and string opera- tions, Basic Operators, Understanding coding blocks, Defining list andlist slicing, Other Data Types (Tuples, List, Dictionary -Python, Arrays, Associative Arrays/Hashes - Perl)

UNIT 2: Control Structures

Conditional blocks using if, else and elif, For loops and iterations, while loops, Loop manipulation using continue, break and else (and pass in Python), Programming using conditional and loops block

UNIT 3: Functions, Modules and Packages

Organizing Perl codes using functions, Organizing Perl projects into modules, Importing own module
as well as external modules, Understanding Packages

UNIT 4: File I/O, Text Processing, Regular Expressions

Understanding read functions, Understanding write functions, Programming using file operations, Powerful pattern matching and searching, Power of pattern searching using regex

UNIT 5: Frameworks

Frameworks - Web2Py, Django, Ruby on Rails, Struts (any one of these or any other)

Suggested Lab Work:

This is a skill course. Topics/concepts taught in the class should be practiced in the Lab same week and practiced regularly during the semester till student becomes confident about it. Students should work on solved and unsolved problems listed in the text books. Teacher also should formulate prob- lems and give them as assignment. This course is all about some theory and a lot of practice.

Reference Books:

1. Taming Python by Programming, Jeeva Jose, Khanna Publishing House
2. Starting Out with Python, Tony Gaddis, Pearson
3. Core Python Programming, Wesley J. Chun, Prentice Hall
4. Python Programming: Using Problem Solving Approach, Reema Thareja, Oxford University
5. Introduction to Computation and Programming Using Python. John V. Guttag, MIT Press.
6. Beginning Python using Python 2.6 and Python 3, James Payne, Wrox

publishing

7. Practical Programming: An Introduction to Computer Science using Python 3, Paul Gries, The Pragmatic Bookshelf

Course outcomes:

At the end of the course student will be able to build program with a scripting language and will be able to learn any other scripting language on their own.

Course Code	PCS-302
Course Title	Scripting Languages
Number of Credits	2 (L: 2, T: 0, P: 0)

Course Learning Objectives:

Inculcate essential technology and software engineering knowledge and skills essential to build a reasonably complex usable and maintainable software iteratively. 2) Emphasize on structured ap- proach to handle software development. 3) Enhance communication skills.

Course Content:

As per the course design, concepts learned as part of this course will/should be used in the Minor Project (Proj.202). These two courses should go hand in hand to be effective.

UNIT 1:

Introduction to Software Engineering, Lifecycle, Process Models - Traditional v/s Agile processes.

UNIT 2:

Development Activities - Requirements Gathering and Analysis, Design Concepts, Software architec- ture and Architectural styles, Basic UI design, Effective Coding and Debugging techniques.

UNIT 3:

Software Testing Basics, Unit, Integration, System and Acceptance Testing, Introduction to various
testing techniques (e.g. Stress testing), Writing and executing test cases, Quality Assurance.

UNIT 4:

Project Management - Project management concepts, Configuration and Release Management, Ver- sion Control and its tools (Git), Release Planning, Change Management, Software Maintenance, Proj- ect Metrics.

Reference Books:

1. Software Engineering – A Practitioner's Approach, 7th Edition, Roger Pressman.

2. Software engineering, Ian Sommerville, Pearson Education

3. An Integrated Approach to Software Engineering, Pankaj Jalote, Springer Verlag

4. Software Engineering, Nasib Singh Gill, Khanna Book Publishing Co. India.

5. Software Engineering, K. K. Agarval, Yogesh Singh, New Age International Publishers

Course outcomes:

The proposed course is expected to provide an introduction to software engineering concepts and techniques to undergraduate students, thus enabling them to work in a small team to deliver a software system. The course content and project will introduce various software technologies, process and project management skills that are needed for the delivery of software in a team setting.

Course Code	PCS-
Course Title	Web Technologies
Number of Credits	2 (L: 2, T: 0, P: 0)

Course Learning Objectives:

To provide basic skills on tools, languages and technologies related to website development. Learn- ings from this course may be used in the Mini Project and summer internship.

Course Content:

UNIT 1: Introduction to www

Protocols and programs, secure connections, application and development tools, the web browser,What is server, setting up UNIX and LINUX web servers, Logging users, dynamic IP Web Design: Website design principles, planning the site and navigation

UNIT 2: Web Systems Architecture

Architecture of Web based systems- client/server (2-tier) architecture, 3-Tier architecture, Building blocks of fast and scalable data access Concepts - Caches- Proxies- Indexes-Load Balancers- Queues, Web Application architecture (WAA)

UNIT 3: Javascript

Client side scripting, What is Javascript, simple Javascript, variables, functions,conditions, loops and repetition

UNIT 4: Advance scripting

Javascript and objects, Javascript own objects, DOM and web browser environments, forms and val- idations, DHTML: Combining HTML, CSS and Javascript, eventsand buttons, controlling your browser, Ajax: Introduction advantages & disadvantages,ajax based web application, alternatives of ajax, XML, XSL and XSLT: Introduction to XML, uses of XML, simple XML,XML keycomponents, DTD and Schemas, XML with application, XSL and XSLT.

Introduction to Web Services

UNIT 5: PHP

server side scripting, Arrays, function andforms,advance PHP Databases :Basic command with PHP examples, Connection to server,creating database, selecting a database, listing database, listing table- names creating a table, inserting data,altering tables, queries, deletingdatabase, deleting data and tables, PHP myadmin and database bugs.

Reference Books:

1. "Web Technologies--A Computer Science Perspective", Jeffrey C.Jackson,
2. "Internet & World Wide Web How To Program", Deitel, Deitel, Goldberg, Pearson Education
3. "Web programming- Building Internet Application", Chris Bales
4. Web Applications: Concepts and Real World Design, Knuckles.

Course Code	PCS-311
Course Title	Computer Programming Lab
Number of Credits	2 (L: 0, T: 0, P: 4)

This Lab course is intended to practice what is taught in theory class of 'Computer Programming' and become proficient in computer programming. Computer programming is all about regular practice. Students should work on solved and unsolved problems listed in the text books, and the problems given by the teacher. Some of the topics that should necessary be covered in lab are listedbelow.

Course Content:

S.No.	Topics for Practice
1	Familiarization with programming environment (Editor, Compiler, etc.)
2	Programs using I/O statements and various operators
3	Programs using expression evaluation and precedence
4	Programs using decision making statements and branching statements
5	Programs using loop statements
6	Programs to demonstrate applications of n dimensional arrays
7	Programs to demonstrate use of string manipulation functions
8	Programs to demonstrate parameter passing mechanism
9	Programs to demonstrate recursion
10	Programs to demonstrate use of pointers
11	Programs to demonstrate command line arguments
12	Programs to demonstrate dynamic memory allocation
13	Programs to demonstrate file operations

The language of choice will be C. This is a skill course. More you practice, better it will be.

Reference Books:

1. Let Us C, Yashavant Kanetkar
2. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House
3. C Programming Absolute Beginner's Guide, Dean Miller and Greg Perry
4. The C Programming Language, Kernighan and Ritchie, Prentice Hall of India
5. Programming in ANSI C, E. Balagurusamy, TataMcGraw-Hill
6. C Programming & Data Structures, B. A. Fouruzan and R. F.Gilberg, CENGAGE Learning.

Course outcomes:

Student should be able to write code snippets, and then compile, debug and execute Them.

Course Code	PCS-313
Course Title	Data Structures Lab
Number of Credits	1 (L: 0, T: 0, P: 2)

Course Learning Objectives:

This Lab course is intended to practice whatever is taught in theory class of 'Data Structures', 'Algo- rithms' and is an extension of previous course on 'Computer Programming'. Students should work onproblems listed in the text books, and the problems given by the teacher. Some of the topics that should necessary be covered in lab are listed below. This Lab course requires a good coordination between theory course in Data Structures and Algorithms.

S.No.	Topics for Practice
1	Write a program using recursive and non-recursive functions to perform search opera- tion in a given list of integers using linear search technique
2	Search operation in a given list of integers using binary search technique
3	Write a program to implement insertion sorting for a given random data
4	Write a program to implement bubble sorting for a given random data
5	Write a program to implement quick sorting for a given random data
6	Write a program to implement selection sorting for a given random data
7	Write a program to implement heap sorting for a given random data
8	Write a program to implement Hashing tables
9	Write a program to implement single linked list
10	Write a program to implement double linked list
11	Write a program to implement circular linked list
12	Write a program to Implement Stack operations using array and linked list
13	Write a program to Implement Queue operations using array and linked list.
14	Write a program to implement Breadth First Search (BFS)
15	Write a program to implement Depth First Search (DFS)
16	Write a program to implement a binary tree of integers
17	Write a program to find the minimum depth of a binary tree

Course Content:

Use 'C' as programming language for the purpose. This is a skill course. More student practice and try
to find solution on their own, better it will be.

Reference Books:

1. Data Structures, R.S. Salaria, Khanna Book Publishing
2. Data Structures Using C, Reema Thareja, Oxford University Press India.
3. Classic Data Structures, Samanta Debasis, Prentice Hall of India.
4. Fundamentals of Data Structure in C, Horowitz, Ellis, Sahni, Sartaj, Anderson-Freed, Susan, University Press, India.
5. Data Structures: A Pseudo code approach with C, Richard F.Gilberg, Behrouz A. Forouzan, CENGAGE Learning, India.
6. Data   Structures   and   Algorithms: Concepts,   Techniques   and

Applications, G. A. V. Pai, McGraw- Hill Education, India.

Course outcomes:

Student will be able to write programs for creating and doing different operations on various data structures. Student will be able to use/implement various algorithms learnt in the course on Algo- rithms. In summary student will have a good command over Data Structures and its applications in Algorithms.