DSC 313: Database Management System [3 0 0 3]	
	3. Peter Rob and Carlos Coronel, Database System- Design, Implementation and Management, 7th ed., Cengage Learning, 2007.

DSC 314: Data Structures [3 0 0 3]	
Prerequisites	NA
Learning Outcomes	▪ Learn to define operations on data structures like arrays, linked lists, trees and graphs ▪ Learn to design algorithms involving these data structures ▪ Learn to analyze simple algorithms and solve recurrences, asymptotic analysis
Syllabus	• Introduction- Algorithm Analysis, Finding Complexity. Fundamental data structures - List- Sorted Lists, Double Linked Lists, Stack & Queue application. [10] • Binary Trees – Insertion and Deletion of nodes, Tree Traversals, Polish Notations, Red Black Trees, B-Trees, Heaps,Priority Queues.[10] • Sorting – Bubble, Selection, Insertion, Merge Sort, Quick Sort, Radix Sort, Heap sort. Searching. [10] • Graphs- Shortest path algorithms, Minimum Spanning Trees, BFS, DFS.[10]
Text & Reference Books	1. Clifford A Shaffer, Data Structures and Algorithm Analysis, ed., 3. 2 (Java Version), 2011. 2. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser. Data Structures And Algorithms In Java™ 6th ed., Wiley Publishers, 2014. 3. Mark Allen Weiss Data Structures and Algorithm Analysis In Java, 3rd ed., 2012. 4. Robert L. Kruse, Data Structures and Program Design In C++, Pearson Education, 2nd ed., 2006. 5. Ellis Horowitz, Fundamentals of Data Structures in C++, University Press, 2015. 6. Ajay Agarwal, Data Structure through C, A Complete Reference Guide, Cyber Tech Publications, 2005. 7. Thomas H Cormen, Charles E Leiserson, Ronald L Rivest, Clifford Stein - Introduction to Algorithms, MIT Press, 3rd ed., 2010.

DSC 315: Computer Organization and Operating System [3 0 0 3]	
Prerequisites	NA
Learning Outcomes	▪ Understanding the fundamental concepts underlying modern computer organization and operating system. ▪ Understanding the memory organization and execution of programs ▪ Designing of an OS.
Syllabus	Part-I: Computer Organization • Computer abstraction and technology: Basic principles, hardware components, Measuring performance: evaluating, comparing and summarizing performance. Instructions: operations and operands of the computer hardware, representing instructions, making decision, supporting procedures, character manipulation, styles of addressing, starting a program. [5]

DSC 315: Computer Organization and Operating System [3 0 0 3]	
	• Computer Arithmetic: signed and unsigned numbers, addition and subtraction, logical operations, constructing an ALU, multiplication and division, floating point representation and arithmetic, Parallelism and computer arithmetic. [4] • The processor: building a data path, simple and multi-cycle implementations, microprogramming, exceptions, Pipelining, pipeline Data path and Control, Hazards in pipelined processors [4] • Memory hierarchy: caches, cache performance, virtual memory, common framework for memory hierarchies Input/output: I/O performance measures, types and characteristics of I/O devices, buses, interfaces in I/O devices, design of an I/O system, parallelism and I/O. Introduction to multicores and multiprocessors. [5] • Part-II: Operating System • Operating system overview: Computer System Organization, Operating System structure, operations of OS, process management, memory management, storage management, protection and security, distributed systems. [2] • Processes: Process concept, Process scheduling, Operations on processes, Cooperating processes, inter-process communication [3] • Threads: Overview, Multi-threading models, threading issues, P threads, Windows XP threads [3] • CPU Scheduling: Basic concepts, scheduling criteria, scheduling algorithms, multiple-processor scheduling [3] • Process synchronization: The critical section problem, Peterson's solution, synchronization hardware, Semaphores, Monitors. Synchronization examples [2] • Deadlocks: Methods for handling deadlocks, Deadlock prevention, deadlock avoidance, Deadlock recovery [1] • Memory management: Swapping, Paging, Segmentation, Virtual memory, Demand paging, Page replacement [4] • I/O Systems: I/O hardware, Application I/O interface, Kernel I/O subsystem, transforming I/O requests to hardware operations[4]
Text & Reference Books	1. D. A. Pattersen and J. L. Hennesy, Computer Organisation and Design: The Hardware/ Software Interface, 4th ed., Morgan Kaufman, 2009. 2. V. P. Heuring and H. F. Jordan, Computer System Design and Architecture, Prentice Hall, 2003. 3. J.L. Hennessy & D.A Pattersen , Computer Architecture: A Quantitative Approach, 5th ed., Morgan Kaufman, 2011. 4. Carl Hamazher, ZvonkoVranesic and SafwatZaky, Computer Organization, 5th ed., McGraw Hill, 2002. 5. William Stallings,Operating systems: Internals & design principles, Pearson, 7th ed., 2014. 6. Andrew S. Tanenbaum, Modern Operating Systems, Pearson 4th ed., 2016. 7. Charles Crowley, Operating Systems - Design Oriented Approach, Mc. Graw Hill Education, 1st ed., 2017.

DSC 316: Machine Learning I [3 0 0 3]	
Prerequisites	NA
Learning Outcomes	On completion of this course, Students should be able to ▪ Introduce fundamental problems in machine learning.