Computer Science And Engineering
(Aug – Dec 2019)

GENERAL GUIDELINES

Do's:-

- Students should be on time for every lecture.
- Students are advised to show due respect to all faculty members.
- Students should keep the Classrooms, Laboratories and Workshops clean and tidy.
- Students must maintain absolute discipline and decorum, while on campus.
- **Students should come prepared with algorithm / flowchart / program / procedure for all the experiments before attending the laboratory session.**
- Students should bring the data sheets and laboratory records completed in all respects to the laboratory.
- Students are advised to clarify their doubts in the respective courses with the faculty.
- Students have to inform their parents that they should follow up the progress of their wards by being in touch with the institution authorities at regular intervals.
- **Students are advised to be present for the mentor meetings conducted by their respective Faculty Advisors, failing which appropriate disciplinary action will be taken.**

Don'ts:-

- Students are not permitted to attend the class without the identity card, once issued.
- **Ragging is strictly prohibited because it is punishable under Karnataka Education Act. Any student involved in ragging, will be severely punished – which includes handing over the case to Police, rustication from the college etc.**
- Writing on desks and walls is strictly prohibited, failing which the students will be fined heavily. If the identity of the individual is not established the entire class / students in the block will be fined.
- **Students must not use their cell phones during class hours. If any student is found using their cell phone during class hours it will be confiscated.**
- Students are not supposed to alter the configuration of the system / any software on the systems.

III SEMESTER (2017-2022)

Sl. No.	Course Code	Course Title	Hours per week				Credits	Course Type
			L	T	P	S		
1	UE18CS201	Digital Design and Computer Organization	4	0	0	0	4	FC
2	UE18CS202*	Data Structures	4	0	0	0	4	CC
3	UE18CS203	Introduction to Data Science	4	0	0	0	4	FC
4	UE18CS204	Web Technologies I	3	0	0	0	3	CC
5	UE18CS205	Discrete Mathematics and Logic	3	0	0	0	3	FC
6	UE18CS206	Digital Design and Computer Organization Laboratory	0	0	2	0	1	FC
7	UE18CS207	Data Structures Laboratory	0	0	2	0	1	CC
8	UE18CS208 X	Special Topic I	0 /2	0	0/4	0/8	2	PW
9	UE19MA101 D	Engineering Mathematics – I(Applicable to Lateral Entry Students)	2	0	0	0	2	FC
Total			**20/22**	**0**	**4/8**	**0/8**	**22/24**	
Note: Prerequisite courses * UE18CS151								

UE18CS201: DIGITAL DESIGN AND COMPUTER ORGANIZATION(4-0-0-0-4)

# of Credits: 4 **# of Hours: 56**

Class	CHAPTER TITLE/ REFERENCE LITERATURE	UNIT NO	TOPICS TO BE COVERED	% OF PORTIONS COVERED	
				REFERENCE CHAPTER	CUMULATIVE %
1	Combinational Logic Design	1	Introduction	**2**	**29**
2			Boolean functions, Truth tables		
3-4			Boolean algebra, Identities		
5-8			Logic minimization, Kmaps		
9-12			Adder/subtractor, Overflow		
13-15			Muxes, Decoders, Shifters		
16			Gate/wire delays, timing		
17-19	Sequential Logic Design	2	Latches, Flip-flops	**3**	**54**
20			Synchronous Logic Design		
21-24			Finite State Machines		
25-26			FSM examples		
27-28			Counters		
29-30			Memory arrays		
31-34	Arithmetic Circuits	3	Carry-lookahead and prefix adders	**5**	**72**
35-37			Shift/add multiplier/divider		
38-39			Wallace tree multiplier		
40			Floating point		
41-42	Architecture	4	Introduction, Assembly Language	**6**	**83**
43-44			Machine Language		
45-46			Addressing Modes		

47	Microarchitecture	5	Introduction, Performance Analysis	**7**	**100**
48-52			Multi-Cycle Processor		
53-54			Systolic array matrix multiply		
55-56			Overview of computer systems organization		

Literature:

Book Type	Code	Title & Author	Publication Information		
			Edition	Publisher	Year
Text Book	T1	Digital Design & Computer Architecutre By David Money Harris, Sarah L Harris	2nd	Morgan Kaufmann	2012
Text Book	T2	Digital Design By M.Morris Mano & Michael D. Ciletti	6th	Pearson	2018
	T3	Computer Organization and Design By David A Patterson, John L Hennessey	5th	Elsevier	2014

UE18CS202: DATA STRUCTURES (4-0-0-0-4)

# of Credits: 4 **# of Hours: 56**

Class #	Chapter Title / Reference Literature	Topics to be Covered	% of Portion Covered	
			% of Syllabus	Cumulative %
Unit 1 :Overview of Data Structures, Lists				
1	**Unit 1** **R1: 1.3,3.2,3.4, 4.5,5.1,5.2 Appendix C**	Overview of course, Programming Practices, Definition of Data structures Classification of Data Structures	**21**	**21**
2		Revision of Structures, union, enumerated data types Definition of pointer ,pointer types Functions, Parameter passing for functions, passing a structure to function		

3		Recursion Example of programs ,Concept of stack frames		
4		Revision of Dynamic Memory allocation 1d array allocation,2d array allocation		
5		List Definition Array based implementation of list with various operations		
6		Linked List Definition, Linked List operations –create, Insert, delete, traverse, update		
7		Linked List-Position Based operations		
8		Link List operations – concatenate, merge ,reverse		
9		Definition and Implementation Of Doubly Linked List Concept of Header nodes, Trailer nodes		
10		Doubly linked list Implementation and operations		
11		Circular Linked List implementation		
12		Multi-List and application of Lists+ Revision of Unit1		
Unit 2 :Stacks, Queues				
13	**Unit 2** **R1: 3.1,4.1-4.3, 4.6** **R2:** **2.3,4.5(page 232)**	Stack – Definition, Operations ,implementation approaches, applications in brief	**20**	**41**
14		Stack – Linked List/Array Implementations		
15		Stack – Applications (post fix conversion)		
16		Stack – Applications (expression evaluation)		
17		Stack – parentheses balancing etc.		
18		Queue – Definition and Operations, implementation approaches, applications in brief		
19		Queue –Array implementation		
20		Queue – Linked list based implementation		
21		Circular Queues – Implementation using arrays		
22		Circular Queues – Implementation using Linked List		
23		Double ended Queue+ Revision of Unit2		
Unit 3 :Graphs, Trees, Binary Trees				
24	**Unit 3** **R1: 11,9.1**	Graph Definition and concepts related to graphs, Applications	**18**	**59**
25		Representations of Graphs Adjacency Matrix Adjacency List		
26		Graph Traversal using BFS		

27		Graph Traversal using DFS		
28		General Tree Representation Traversals, Applications		
29		Binary Tree :-Definition, terminologies, Representations		
30		Binary Tree Implementation		
31		Binary Tree Traversals,		
32		Binary Tree Recursive operations		
33		Revision of Unit3		
Unit 4 : Binary Search Tree, Heap Tree				
34	**Unit 4** **R1:7.9,9.2, 9.3 , 9.4** **Appendix B5**	Building and evaluating Expression Tree	**23**	**82**
35		Binary Search Tree Definition, Terminologies, Applications		
36		Constructing a BST		
37		BST operations : insert ,delete		
38		AVL Tree Definition ,concepts applications		
39		Insert operation in AVL		
40		Delete operation in AVL		
41		Threaded Binary Search Tree		
42		Heap Implementation		
43		Heap operations-Insert ,Delete		
44		Heap Trees – Find Min		
45		Priority Queue using Heap		
46		Revision of Unit4		
Unit 5: Tries, Hashing				
47	**Unit 5** **R1: 10.2,8.6**	Tries : Definition Implementation	**18**	**100**
48		Tries : Implementation Applications		
49		Tries : Applications		
50		Hash Table ,Hash Functions		
51		Collision Handling – Open Addressing		
52		Collision Handling – Open Addressing		
53		Collision Handling – Chaining		
54		Collision Handling – Chaining		
55		Revision		
56		Course Summary		

Literature

Book Type	Code	Title & Author	Edition	Publisher	Year
Refere	R1	*"Data Structures and Program*	2	Pearson/PHI	2015

nce		***Design in C"***, Robert Kruse, C.L.Tondo, Bruce Leung and Shashi Mogalla, Second Edition, /PHI, 2015			
Reference	R2	***"Data Structures Using C and C++",*** Tanenbaum, Langsam, Augenstein Pearson/Prentice Hall , 2nd Edition, 2015	2	Pearson/Prentice Hall	2015

UE18CS203: INTRODUCTION TO DATA SCIENCE (4-0-0-0-4)

# of Credits:4 **# of Hours: 56**

Class #	Chapter Title/Reference Literature	Topics to be covered	% of Portion	
			% of syllabus	Cumulative
1.	**Unit: 1** **Introduction to Data Science,Statistics and Visualizing data** **T1: Chapter 1 1.1-1.3;**	**Introduction to Data Science:** Motivating Examples and Scope.	**23.21%**	**23.21%**
2.		**Statistics :** Introduction, Types of Statistics		
3.		**Sampling : Introduction,**Sampling methods. (1.1)(Excluding Types of experiments)		
4.		Sampling methods.(1.1)		
5.		Sampling errors.(Handout)		
6.		**Getting and Analyzing Data:** Scraping the Web,Reading Files, (Handout)		
7.		Need for Data Cleaning,Basics of Data Cleaning.(Handout)		
8.		**Summary Statistics(1.2)**		
9.		**Summary Statistics (1.2)Contd..**		
10.		**Data Visualization and Interpretation :**		

		Graphical summaries-Histogram.(1.3)		
11.		Visualizing Data: Bar Charts(Handout)		
12.		Visualizing Data: two variables (scatter plots) (1.3)		
13.		Good vs. Bad Visualization.(Handout)		
14.	**Unit: 2** **Random Variables and Probability Distributions** **T1: Chapter 2 2.4 – 2.5, Chapter 4 4.1 – 4.3, 4.5**	Brief overview of Probability Basics.(Handout) (Self Learning) **Random Variables** : Introduction,Discrete Random Variables(2.4)	**21.42%**	**44.63%**
15.		Continuous Random Variables(2.4)		
16.		Continuous Random Variables(2.4) **Contd.**		
17.		Linear Functions of Random Variables.(2.5)		
18.		Linear Functions of Random Variables.(2.5)		
19.		**Probability Distributions:** The Bernoulli Distribution(4.1)		
20.		The Binomial Distribution(4.2)		
21.		The Poisson Distribution(4.3)		
22.		The Normal Distribution(4.5)		
23.		Chebyshev's inequality(2.4),Derivation of Distributions:Bernoulli distribution(Handout)ss		
24.		Derivation of Distributions.:Binomial Distribution,Poisson Distribution(Handout)		
25.		Derivation of Distributions:The Normal Distribution.(Handout)		
26.	**Unit: 3** **Sampling and Estimation** **T1: Chapter 4 4.9 – 4.11; Chapter 5**	Principles of Point Estimation : Mean squared error(4.9)	**23.21%**	**67.84%**
27.		Maximum likelihood estimate (4.9)+(Handout)		
28.		Maximum likelihood estimate (4.9)+(Handout)		
29.		Normal Probability Plot (4.10)		
30.		**Sampling concepts :** The Central Limit Theorem and its applications(4.11)		
31.		The Central Limit Theorem Applications.(4.11)		

32.	**5.1-5.4, 5.7**	**Confidence Intervals :** Introduction,Interval estimates for mean of large samples.(5.1)		
33.		Interval estimates for mean of large samples. (5.1)		
34.		Interval estimates for proportion of large samples. (5.2)		
35.		Confidence intervals for mean of Small Samples.(5.3) Student's t Distribution		
36.		Confidence Intervals for the Difference Between Two Means for large samples(5.4)		
37.		Confidence Interval estimates for paired data. (5.7)		
38.		Factors affecting Margin of Error.(Handout)		
39.	**Unit: 4** **Hypothesis and Inference.** **T1: Chapter 6 6.1 – 6.3, 6.5,6.9, 6.10**	**Hypothesis Testing:**Introduction**,** (6.1)Large sample tests for a Population Mean	**14.28%**	**82.12%**
40.		Large sample tests for a Population mean (6.1)C**ontd.**		
41.		Drawing conclusions from the results of Hypothesis tests(6.2)		
42.		Drawing conclusions from the results of Hypothesis tests(6.2)**contd.**		
43.		Large sample tests for a Population proportion (6.3)		
44.		Large -Sample tests for Difference between two means(6.5)		
45.		Distribution Free Tests.(6.9)		
46.		Chi-squared Test.(6.10)		
47.	**Unit: 5** **Errors of Hypothesis Testing** **T1: Chapter 6 6.12,6.13** **Simple Linear Regression.** **T1: Chapter 7 7.1 – 7.4;**	Fixed Level Testing(6.12)	**17.88%**	**100%**
48.		Fixed Level Testing.(6.12)		
49.		Power of a Test.(6.13)		
50.		Factors affecting Power of a Test.(Handout)		
51.		**Simple Linear Regression:** Introduction**,**Correlation.(7.1)		
52.		The Least squares Line.(7.2)		
53.		Predictions using regression models - Uncertainties in Regression Coefficients.(7.3)		
54.		Predictions using regression models - Uncertainties in Regression Coefficients. (7.3)**Contd..**		
55.		Checking Assumptions and transforming data.		

		(7.4)		
56.		Checking Assumptions and transforming data. (7.4)**contd.**		

Literature:

Book Type	Code	Title & Author	Publication Information		
			Edition	Publisher	Year
Text Book	T1	Statistics for Engineers and Scientists, William Navidi.	3rd	McGraw Hil Education, India	2013
Reference Book	T2	The Art of Computer Systems Performance Analysis: Techniques for Experimental Design, Measurement, Simulation, and Modeling,Raj Jain		Wiley	2008
Reference Book	T3	Data Science From Scratch, Joel Grus	1st	O'Reilly	2015
Reference Book	T4	Sampling- Design and Analysis,Sharon L. Lohr	2nd	Cengage	2010

UE18CS204: WEB TECHNOLOGIES- I (3-0-0-0-3)

# of Credits:3 **# of Hours:42**

Class #	Chapter Title/Reference Literature	Topics to be Covered	% of Portions Covered	
			% of Syllabus	Cumulative %
1.	**Unit #1 T2 : Ch. 1,2,3,4 (upto section 4)**	Internet, WWW, Web Servers and Browsers, URLs	**17.85%**	**17.85%**
2.		Basic Markup, Images, Hyperlinks		
3.		Lists, Tables		
4.		Forms		

5.		User Interface Design - CSS		
6.		User Experience		
7.		Introduction to Client-Side Scripting, JavaScript Basics		
8.		Introduction to Client-Side Scripting, JavaScript Basics		
9.	**Unit #2 T2: Ch 4 (section 5-11) T1: Chapter 21-27**	Functions	**21.42%**	**39.27%**
10.		Hoisting		
11.		JavaScript Objects (Built in)		
12.		Arrays , Objects		
13.		Objects		
14.		Screen Input and Keyboard Output		
15.		Accessing and Modifying DOM		
16.		Accessing and Modifying DOM		
17.	**Unit #3 T1: Ch 6,28-32 Handouts for Reference**	Events and Event Handlers	**21.42%**	**60.69%**
18.		Events and Event Handlers		
19.		Mouse Events, Load Events		
20.		Key and Form Related Events		
21.		Key and Form Related Events		
22.		Event Bubbling		
23.		Timers, Synthetic Events,		
24.		JS Cookies		
25.	**Unit #4 T3: Ch 7,8**	Local Storage – Theory	**17.85%**	**78.54%**

26.	**Handouts for Reference**	Local Storage – Handson		
27.		Web Workers		
28.		Offline Web Applications		
29.		HTTP MIME		
30.		Request Response Formats Basics		
31.		Apache: Installation		
32.		Apache: Configuration & Debugging,		
33.		The .htaccess file		
34.		The .htaccess file		
35.	**Unit #5 T1: Ch 9,10 Handouts for Reference**	File Handling and System Calls	**21.46%**	**100%**
36.		Strings and Regular Expressions		
37.		Arrays		
38.		Cookies		
39.		Sessions		
40.		Functions, Classes		
41.		AJAX: Asynchronous GET/POST		
42.		Database Access		

Literature

Book Type	Code	Title & Author	Publication Information		
			Edition	Publisher	Year
Text Book	T1	JavaScript Absolute Beginner's Guide", Kirupa Chinnathambi	1st	Que Publishing	2017

Text Book	T2	Programming the World Wide Web, Robert W Sebesta	7th	Pearson	2013
Text Book	T3	HTML5 Up and Running", Mark Pilgrim,	1st	O' Reilly	2012
Online Reference	R2	W3 Schools	www.w3schools.com		

UE18CS205: DISCRETE MATHEMATICS AND LOGIC (3-0-0-0-3)

# of Credits:3 **# of Hours: 42**

Unit	Hour	Portions to be covered	Percentage of portions covered	
			% of syllabus	Cumulative %
Unit 1 Logic T1: 1.1 - 1.5	1	Motivation, Propositional Logic - Basic Connectives and Truth Tables	**24**	**24**
	2	Propositional Logic - Conditional and Biconditional Statements		
	3	Propositional Logic - Tautology and Contradiction		
	4	Propositional Equivalences - Logical Equivalences		
	5	Propositional Equivalences - Laws of Logic		
	6	Predicates & Quantifiers		
	7	Nested Quantifiers		
	8	Rules of Inference		
	9	Rules of Inference		
	10	Arguments		
Unit 2 Sets, Functions and Relations T1: 2.1 - 2.3 7.1-7.3,7.5,7.6	11	Sets and Set Operations	**17**	**41**
	12	Functions		
	13	Relations and Their Properties		
	14	Representing Relations		
	15	Equivalence Relations and Classes		
	16	Partial Orderings		
	17	Hasse Diagrams, Lattices		
Unit 3 Counting T1:	18	Basic Counting Principles - The Sum and the Product Rules	**17**	**58**
	19	The Pigeonhole Principle		

5.1 – 5.4 T1:Graphs 8.1 - 8.5	20	Applications of the Pigeonhole Principle		
	21	Permutations		
	22	Combinations		
	23	Binomial Coefficients and Binomial Theorem		
	24	Identities of the Binomial Coefficients		
Unit 4 Induction, Recursion and Recurrence Relations, Graphs T1: 4.1 - 4.2 6.1	25	Mathematical Induction	**19**	**77**
	26	Strong Induction		
	27	Recurrence Relations		
	28	Modelling with Recurrence Relations		
	29	Graphs: Definition, The handshaking Theorem		
	30	Complete Graphs, Regular graph		
	31	Paths, Connectivity		
	32	Euler and Hamilton Graphs		
Unit 5 Algebraic Structures T1: 11.1 - 11.7	33	The Structure of Algebras	**23**	**100**
	34	Semigroups, Monoids		
	35	Groups, Subgroups		
	36	Generators for a group		
	37	Cosets and Lagrange's Theorem		
	38	Isomorphisms and Automorphisms		
	39	Homomorphisms		
	40	Normal Subgroups & Congruence Relations		
	41	Coding Theory		
	42	Hamming Codes		

Literature

- "Discrete Mathematics and its Applications", Kenneth H Rosen, 7th Edition (Indian adaptation by Kamala Krithivasan), Tata McGraw-Hill, 2011.

- "Discrete and Combinatorial Mathematics: An Applied Introduction", Grimaldi, Ramana, 5th Edition, Pearson, 2011.

UE18CS206: DIGITAL DESIGN AND COMPUTER ORGANIZATION LABORATORY(0-0-2-0-1)

# of Credits: 1 **# of Weeks: 13**

SESSION	TASKS
1	IMPLEMENTATION OF 4 X 1 MUX USING LIB.V FILE.
2	IMPLEMENTATION OF FOUR BIT CARRY ADDER

3	IMPLEMENTATION OF 16 – BIT ALU – 1
4	IMPLEMENTATION OF 16 – BIT ALU – 2
5	IMPLEMENTATION OF EIGHT 16 – BIT REGISTERS
6	INTEGRATING ALU WITH REGISTER ARRAY
7	IMPLEMENTATION OF 10 – BIT PROGRAM COUNTER
8	INTEGRATING ALU WITH REGISTER ARRAY AND PROGRAM COUNTER
9	IMPLEMENTATION OF CONTROL LOGIC
10	IMPLEMENTATION OF CONTROL LOGIC FOR LOAD AND JUMP INSTRUCTIONS
11	INTEGRATING THE COMPLETE MICROPROCESSOR
12	IMPLEMENTATION OF MINI PROJECT – 1
13	IMPLEMENTATION OF MINI PROJECT – 2
14	FINAL SEMESTER ASSESSMENT

UE18CS207 – DATA STRUCTURES LABORATORY(0-0-2-0-1)

# of Credits: 1 **# of Weeks: 13**

Preamble	Data Structure Laboratory is a core course and complements the theory course in Data structures. In the theory course, the students are given a fresh approach to various Data Structures - implementation. In the lab course, the students implement these Data Structures using in a programming language - C.
Objective	• Enable the learner with the concepts of recursion and linear data structures viz., Linked Lists, Stacks and Queues. • Enable the learner with the concepts of non-linear data structures viz., Graphs, Trees, Heaps, Trie and Hashing. • Hone the learner such that they obtain the ability to compare different implementations of data structures and recognize the advantages and disadvantages of the different implementations. • Inculcate in the learner, the aspects of choosing the appropriate data structure and algorithm design method for a specified application and with usage of standard library
Outcome	• Implement fundamental data structures viz., Lists, Stacks, Queues, Linked Lists, Binary Trees from first principles. • Demonstrate the use of appropriate data structures for a given problem. • Design and implement solutions to basic practical problems using customized data structures.

	• Develop quick and foolproof solutions to practical problems using abstract data types.

Session	Tasks
1	Practice Programs – Pointers, Dynamic Memory Allocation, Program Implementation using Make file
2	Implementation of a singly linked list with insert and other operations
3	Implementation of a singly linked list with delete and other operations
4	Implementation of a doubly linked list with insert , delete and other operations.
5	Implementation of a stack using a singly linked list.
6	Parentheses matching using stack data structure.
7	Infix to Postfix conversion.
8	Implement a queue using a singly linked list.
9	Implement a circular queue using an array.
10	Implement Stack and Queues using Arrays
11	Implementation of a BST and tree traversals methods.
12	Construction of a max-heap.
13	Implementation of a Priority Queue using a min-heap

UE18CS208A: OPERATION LINUX

# of Credits: 2 **# of Hours: 28**

Start your own internet company with Linux

Start your own internet start-up company in the 3rd Semester and add impressive lines to your resume. The Unix and Linux operating system, often collectively referred to as **nix* has been around for quite some time. Though unrecognizable to many, **nix* can be found almost ***anywhere and everywhere*** ranging from your gaming console, car's infotainment system to the immensely and insanely powerful servers of ***AWS*** *and et al.* This course will aim to introduce you to the applications of **nix* in the real world of companies like Amazon, Google and Startups, etc. It will focus on a practical approach to learn the world of internet infrastructure which is essential for every developer to know. This course will emphasize the synergy of the ***dev-ops (developer- operations)*** model which is necessary for success of every project/initiative at any company you might work in. If you however decide to be an entrepreneur it will teach you to configure your own internet company infrastructure with zero licensing costs.

Course Learning outcomes

- **Introduction to Linux/Unix and Shell Programming:**
  - ***Introduction to *nix*:** Salient Features, Layered Architecture, Concept: Shell & Kernel, File System

- ***File System Related Commands*:** Creating and Removing Directories and Files, Viewing the Content of the File, Copying/Moving Files, Hard/Symbolic Links, inode Structure, View Directory
- ***Types of Files*:** Regular Files, Directories, Character/Block Device, Named Pipes, Socket Files
- ***File Permissions/Time Stamp*:** File Permissions, EUID, Sticky bit, effect on Different Commands
- ***Process*:** Process Related Commands, Concept of Process, Process Status, Child and Parent Process, Process ID, Orphan and Zombie, bg/fg Processes, Executing Command at a Particular Time.
- ***Shell Programming***: Meta Characters, Redirection and Piping, Filters, Variables – Input/ Output and Assignment, Quoting, Shell Scripts, Environment Variables – Export Command, Relational and Logical Operators, Looping. Command Line Arguments and Shift Command, Arithmetic in Shell Programs, Calling Another Shell Program Within Another Shell Program – user Defined Functions.

- **Learn the tier'ed infrastructure of internet companies like Google, Amazon and startups**
- **Configure your own Internet Company with Zero License Costs:**
  - *Install and Configure the following devices*
  - ***Linux*** – Install Ubuntu Linux, learn basic commands, install packages, IP/DNS
  - ***Firewalls*** – Install and learn how to keep the bad away from the good when connected to the fun and useful yet incredibly dangerous
  - ***Load balancers*** – Install ngnix and learn these devices which are responsible for distributing the millions of requests Google or Amazon receives, to one of their million back end servers
  - ***Webservers*** – Install apache. These are machines with as many as 16 cores and 64GB of RAM used for lightning fast responses to requests of the client
  - ***Application Servers*** – Install Django - Develop and deploy apps via frameworks
  - ***Database Servers*** – Install mysqli. Learn to organize, store and secure your data
  - ***IDS*** (Intrusion Detection Services) – Install and learn how to spy on your network
  - ***tcpdump*** - Learn the basics of how to track and trap your network packets
- **Basic world of "How to Trouble shoot nix" and RAS capability of nix**
- **Configure a basic application on your own Internet Company Infrastructure**
  57. Learn the basics of an internet application and its working
  58. Configure an internet application on the above infrastructure and start to sell/market
- **At the end of this course – You will improve your resume and register a company to your name**

Grading: 4 assignments – 60% ISA; ESA – 40% ***project based, no final exam***. Instructor and peer reviews

References: "UNIX Concepts and Applications", Sumitabha Das, 4th Edition, McGraw Hill & YouTube

Pre-requisites: Must bring a laptop to class and should be a motivated self-learner.

Computer Science And Engineering
(Aug – Dec 2019)

UE18CS208B: PROGRAMMING WITH C++ (2-0-0-0-2)

# of Credits: 2 **# of Hours: 28**

Class #	Chapter Title / Reference Literature	Topics to be Covered	% of Portion covered	
			% of Syllabus	Cumulative %
1	Unit#1 Chapter 1,6,15	Introduction, Features of C++, Object Oriented Concepts, Composition, Polymorphism	20	20
2		Simple Input/ Output Operations, Introduction to Namespaces - Avoiding Pollution of Global Namespace, Constants and Variables		
3		User Defined Function, Function Call Mechanism, Function Overloading – Static Polymorphism, Function Call Resolution		
4		Default Parameters, Reference Parameters, Pointers and Dynamic Allocation, Alias		
5		Garbage and Dangling Reference, Reference Variable, Pointers and Reference, Efficiency and Flexibility, Inline Function, Template Function, lambda Functions.		
6	Unit#2 Chapter 15	Structure and Class	18.5	38.5
7		Data Member, Member Function, Access Specifier, Constructors and Destructors		
8		Initialization List, Dynamic Memory Management using Constructors and Destructors		
9		Copy Constructor, Copy Assignment Operator		
10		Move Semantics, Move Assignment Operator		
11		Move Copy Constructor		
12	Unit #3 Chapter 7	Friend Function, Friend Class	30	68.5
13		Operator Functions		
14		Binary Operator, Binary Operator ++		
15		Index Operator, Conversion Function		
16		Insertion and Extraction Operators		
17		Static Members		
18	Unit#4 Chapter 14,	Inheritance	15.5	84
19		Constructor and Destructor		

20	**15**	Copy Constructor, Assignment, Access Specifiers		
21		Virtual Functions and Polymorphism, Function Overriding, VTBL and VPTR		
22		Pure Virtual Functions and Abstract Base Class, Virtual Destructors		
23	**Unit #5 Chapter 16**	Multiple Inheritance	**16**	**100**
24		Virtual Base Classes		
25		Type Casting		
26		Run Time Type Identification (RTTI), Composition		
27		Class Templates		
28		Exception Handling		

Literature

Book Type	**Code**	**Title & Author**	**Publication Information**		
			Edition	**Publisher**	**Year**
Reference Book	R	C++ Primer – Stanley Lippman, Josee Lajoie, Barbara E Moo	5	Addison-Wesley	2012

UE18CS208C: PROGRAMMING WITH JAVA (2-0-0-0-2)

# of Credits: 2 **# of Hours: 28**

Class #	**Chapter Title**	**Topics to be Covered**	**% of Portion covered**	
			% of Syllabus	**Cumulative %**
	Unit 1			
1	**Java Fundamentals:**	Introduction to Programming in Java, Java Language and Java Platform, Program Structure, Translation Process, Simple I/O, Constants, Variables, Type, Mixed Mode Operation, Primitive Types and Reference Types, Object based Programming, Abstraction, Encapsulation, Composition	**20**	**20**
2		Class Attributes, Behaviour, Objects, and Methods, Interface and Implementation, Instance Fields and Methods, Initialization of Fields, Role of Constructors and		

		Destructors		
3		Garbage Collector, Parameter Passing, Value Type and Reference Type, Overloading of Methods, Scope. Control Structures, Selection – if, switch, Looping – while, for, do while, break and continue, Nested Control Structures.		
	Unit 2			
4	**Recursion. Class Attributes and Behaviour**	Difference between Class Methods and Instance Methods, Necessity to Use Class Methods. Enumerated Data Type	**20**	**40**
5		Enumerated Data Type (cont..)Class Containing Fixed Number of Objects. Programming for Safety: Assertions, Exception Handling		
6		Exception Handling(cont..), Exception Propagation, Use and Misuse of Exception Mechanism.		
	Unit 3			
7	**Arrays as Abstract Data Type:**	Creation, Initialization, Methods on Arrays, Built-In Methods, Higher Order Arrays Strings as Abstract Data Type: Creation, Initialization	**20**	**60**
8		String Immutability, String Methods, Composition and Inheritance: **"**has a" and "is a" Relationship, LISKOV's Property of Substitution		
9		When to Use and When Not to Use Inheritance, Super and Sub Classes, Polymorphism, Overriding.		
	Unit 4			
10	**Inheritance (Continued):**	Concepts of Single Rooted Hierarchy and Interface, Abstract Class in Programming Languages, Object Class in Java.	**20**	**80**
11		**Composition**: Flexibility of Composition over Inheritance, Examples of Composition and Inheritance.		
12		**Package:** Need of Package Concept, User Defined Package, Introduction to Built-In Packages.		
	Unit 5			

13	**Nested Types:**	Need for Type within Type, Different Types of Inner Classes, Anonymous Inner Classes, Callback Mechanism. Persistence, Reading from Files, Writing into Files, Concept of Serialization.	**20**	**100**
14		**Introduction to Generics and Collections:** Generic Programming Concepts, Concept of Generic Box, List Interface, Sort and Search.		

Literature

Book Type	**Code**	**Title & Author**
Reference Book	R1	"Core Java Volume I – Fundamentals", Cay S Horstmann, Gary Cornell, 9th Edition, Pearson.
	R2	"Learning Java", Patrick Niemeyer and Daniel Leuck, 4th Edition, O'Reilly.

UE18CS208D: PROGRAMMING WITH R (2-0-0-0-2)

# of Credits: 2 **# of Hours: 28**

Class	**CHAPTER TITLE/ REFERENCE LITERATURE**	**TOPICS TO BE COVERED**	**% OF PORTIONS COVERED**	
			UNIT	**CUMULLATIVE**
1	**Unit 1: Text books: T1,T2,T3,T4, Online Resources**	Understanding R Programming environment	**18**	**18**
2		Basics of R, Overview of R,		
3		R data types and objects		
4		Reading and writing data.		
5	**Unit 2: Text books: T1,T2,T3,T4, Online**	Data Structures in R – Vectors	**26**	**44**
6		Matrices, Factors		
7		Data Frames and Lists		
8		Control structures		

9	**Resources**	Functions, scoping rules		
10		Dates and times		
11		Using Strings in R.		
12	**Unit 3:**	Loop functions: lapply() sapply() apply()	**18**	**62**
13	**Text books:**	Loop Functions - tapply() mapply()		
14	**T1,T2,T3,T4,**	Debugging in R		
15	**Online Resources**	Debugging tools		
16	**Unit 4:**	Applying Probability in R – Introduction to Probability in R and Random & Continuous Variables.	**19**	**81**
17	**Text books:**	Bernoulli, Binomial Distributions		
18	**T1,T2,T3,T4,**	Poisson Distribution		
19	**Online**	Normal Distribution		
20	**Resources**	Discussion on Other common distributions		
21		Application of generic Statistics methods using R		
22	**Unit 5:**	Graphics in R	**19**	**100**
23		Data visualization		
24	**Text books:**	Data visualization and Manipulation tricks		
25	**T1,T2,T3,T4,**	Calculation Eigen values and vectors		
26	**Online**	Introduction to PCA		
27	**Resources**	Principal component analysis		
28		Finding clusters.		

Literature

Book Type	Code	Title & Author	Publication Information		
			Edition	Publisher	Year
Text Book	T1	**An Introduction To Statistical Learning – With Applications in R**	2	Springer	2009
	T2	**R Programming For Data Science**	1	Leanpub	Updated-2018
	T3	**Exploratory Data Analysis With R**	1	Leanpub	2015
	T4	**R In Action**	3	Manning publications manning.com	Updated-2015