Computer Science And Engineering
(Aug-Dec, 2020)

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.

Computer Science And Engineering
(Aug-Dec, 2020)

III SEMESTER (2019-2023)

Sl. No.	Course Code	Course Title	Hours per week				Credits	Tools/ Languages	Course Type
			L	T	P	S	C		
1	UE19CS201	Digital Design and Computer Organization	4	0	0	4	4		CC
2	UE19CS202	Data Structures and its Applications	4	0	0	4	4		CC
3	UE19CS203	Statistics for Data Science	4	0	0	4	4	Python	CC
4	UE18CS204	Web Technologies	4	0	0	4	4	MERN Technologies, HTML, CSS, Java script	CC
5	UE19CS205	Automata Formal Languages and Logic	4	0	0	4	4	JFLAP	CC
6	UE19CS206	Digital Design and Computer Organization Laboratory	0	0	2	1	1	Icarus, Verilog Simulator, GTKWave waveform viewer	CC
7	UE19CS207	Data Structures and its Applications Laboratory	0	0	2	1	1	Hacker earth / C	CC
8	UE19CS208 X	Special Topic I	0 /2	0	0 /4	0/8	2		ST
9	UE20MA101 D	Engineering Mathematics – I(Applicable to Lateral Entry Students)	2	0	0	0	2		FC
Total			**20/22**	**0**	**4/8**	**4/8**	**24/26**		
	Note: Prerequisite courses None								

Computer Science And Engineering
(Aug-Dec, 2020)

UE19CS201: DIGITAL DESIGN AND COMPUTER ORGANIZATION (4-0-0-0-4)

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

Class No.	Chapter title/ Reference literature	Portions to be covered	Absolute %	Percentage of Syllabus Covered
1	**UNIT # 1** **(Combinational Logic Design)** Lecture 1 slides	Introduction	**21.5**	**21.5**
2	**T1: Chapter 1 From Zero to One** 1.4, 1.5	Boolean functions, Truth tables		
3-4	**T1: Chapter 2 Combinational Logic Design** 2.1, 2.2, 2.3	Boolean algebras, Identities		
5-8	2.7	Logic minimization, K-maps		
9-12	**T1: Chapter 1 From Zero to One** 1.4.6 **T1: Chapter 5 Digital Building Blocks** 5.2.1, 5.2.2	Adder Subtractor, Overflow		
13–15	**UNIT # 2** **(Combinational and Sequential Logic Design)** **T1: Chapter 2 Combinational Logic Design** 2.8, 2.6, Handouts 2.9 (exclude contamination delay)	Muxes, Decoders, Shifters	**21.5**	**43**
16		Gate/Wire delays, Timing		
17-19		Latches, Flip-flops		
20		Synchronous Logic Design		

21-24	**T1: Chapter 3 Sequential Logic Design** 3.2 (excluding 3.2.7) 3.3 (excluding 3.3.1, 3.3.3) 3.4 (excluding 3.4.4)	Finite State Machines		
25-26	**UNIT #3 (Sequential Logic and Arithmetic Circuits)** **T1: Chapter 3 Sequential Logic Design** 3.4.1, examples 3.6, 3.7, 3.9	FSM examples	**17.8**	**60.7**
27-28	**Handout** Link 1	Counters		
29-30	**T1: Chapter 5 Digital Building Blocks** 5.5, 5.5.1 5. 2.1	Memory Arrays		
31-34		Carry-lookahead and Prefix Adders		
35–37	**UNIT #4 (Arithmetic Circuits and Architecture)** **R3: Chapter 9 Arithmetic** 9.4	Shift/add Multiplier/Divider	**17.8**	**78.5**
38-39	**Handout** Link 2 29.2.3, 29.3.2	Wallace Tree Multiplier		
40	**T1: Chapter 5 Digital Building Blocks** 5.3.2 (excluding subsections Rounding and Floating-Point Addition)	Floating point		
41-42		Introduction, Assembly Language		

43-44	**Chapter 6 Architecture** 6.1, 6.2 6.3, 6.4.1 6.4.2, 6.4.3 (exclude switch/case statements) 6.4.4 (exclude magnitude comparison)	Machine Language		
45-46	**UNIT #5** **(Microarchitecture)** **T1: Chapter 6 Architecture** 6.5	Addressing modes	**21.5**	100
47	**T1: Chapter 7 Microarchitecture** 7.1, 7.2, 7.4 (exclude 7.3.3, 7.3.4, 7.4.3)	Introduction, Performance Analysis		
48-52		Single-Cycle, Multi-Cycle Processor		
53–54	**Handout** Link 3	Systolic array matrix multiply		
55–56	**Handout** Link 4	Overview of Computer Systems Organization		

Text Book(s):

1. Digital Design & Computer Architecture, David Money Harris, Sarah L Harris

References:

1. Computer Organization and Design, David A Patterson, John L Hennessey
2. Digital Design, M.Morris Mano & Michael D. Ciletti
3. Computer Organization, Carl Hamacher, Safwat Zaky, Zvonko Vranesic

Links

1. https://inst.eecs.berkeley.edu/~cs150/sp13/agenda/lec/lec22-counters.pdf
   (pages 4-6 numbered as pages 7-11, skip Verilog and parallel prefix)
2. http://staff.ustc.edu.cn/~csli/graduate/algorithms/book6/chap29.htm
3. http://web.cecs.pdx.edu/~mperkows/temp/May22/0020.Matrix-multiplication-systolic.pdf
4. https://www.youtube.com/watch?v=lPIXAtNGGCw upto 11:48

Computer Science And Engineering
(Aug-Dec, 2020)

UE19CS202: DATA STRUCTURES AND APPLICATIONS (4-0-0-4)

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

Class #	Chapter Title/Reference Literature	Topics to be Covered	% of Portions Covered	
			% of Syllabus	Cumulative
1.	Unit-1: Overview, Linked Lists and its Applications T1 : Chapter 4 (4.2,4.3, 4.5)	Introduction , Static and Dynamic Memory allocation	21.4	21.4
2.		Overview of Linked Lists, Singly Linked Lists		
3.		Operations on Singly Linked Lists		
4.		Introduction to Doubly linked Lists		
5.		Operations on Doubly linked Lists		
6.		Circular Singly Linked list		
7.		Circular Doubly Linked list		
8.		Introduction to Multilist: Example Sparse Matrix.		
9.		Application: Design of Text Editor using SLL/DLL.		
10.		Text Editor Continued..		
11.		Design of a Symbol table in an Assembler.		
12.		Symbol Table continued.		
13.	Unit-2: Stacks , Queues and its Applications T1 : Chapters 2 (2.1,2.2,2.3) 4 (4.1)	Basic Structure of a Stack	21.4	42.8
14.		Implementation of stack using arrays, linked list		
15.		Applications of stack : Function, nested functions., Recursion: Tower of Hanoi.		
16.		Infix to postfix and Prefix expression: Implementation		
17.		Evaluation of a postfix expression, implementation of pareenthesis matching		

18.		Basic structure of Queue, Implementation of simple using Array.		
19.		Circular Queue: Implementation		
20.		Priority Queue: Implementation		
21.		Dequeue : Implementation		
22.		Linked List Implementation of a Queue		
23.		Implementation of CPU Scheduler using queue		
24.		Implementation of Josephus Problem		
25.	Unit-3: Trees, Heaps ,Priority Queue and Applications T1 : Chapter 5(5.1,5.2,5.5) 6(6.3) 7(7.1, 7.2)	Definition: Trees: N-ary trees, Binary Trees, Binary Search Trees and Forest, properties, conversion of an N-ary tree and a Forest to a binary tree.	21.4	64.2
26.		Implementation of BST using dynamic allocation : Insertion operation		
27.		Implementation & Traversal of trees: Preorder, Inorder and Postorder		
28.		BST: Deletion operations		
29.		BST: Implementation using Arrays		
30.		Implementation of binary expression tree		
31.		Threaded binary search tree and its implementation		
32.		Application: Implementation of a dictionary of words and their meanings.		
33.		Design of dictionary continued…		
34.		Heap: Definition & Implementation.		
35.		Implementation of priority queue using min heap/max heap.		
36.		Design of a priority queue in airport simulation for landing and takeoff of flights.		
37.	Unit-4: Balanced Trees & Graphs	Balanced Trees: Definition, AVL Trees	17.8	82.1
38.		Rotations in AVL Trees.		

39.	T1: Chapters 7(7.2) 8(8.1,8.3,8.4)	Graphs: Introduction, Properties, Representation of graphs: Adjacency matrix, Adjacency list.		
40.		Implementation of graphs using adjacency matrix		
41.		Implementation of graphs using adjacency lists.		
42.		Graph traversal methods: Depth first search.		
43.		Breadth first search techniques.		
44.		Application: Computer Network-Representation		
45.		Representation of network topology, Finding path using BFS / DFS.		
46.		Graph Connectivity to check using BFS and DFS.		
47.	Unit-5: Suffix Tree , Hashing Techniques T1: Chapters 7(7.3,7.4) 32.	Indexing in databases (B Tree: K-way tree)- Insertion and deletion operations with examples.	17.8	100
48.		Suffix Trees: Definition, Introduction of Trie Trees, suffix trees		
49.		Implementation of Trie trees, insert, delete and search operations.		
50.		Application: URL decoding		
51.		Hash: definition, hash function, hash table.		
52.		Collision Handling: Separate Chaining		
53.		Collision Handling: Open Chaining		
54.		Double hashing, Rehashing		
55.		Application of hashing in Cryptography.		
56.		Summary of Data Structures.		

Text Book(s):

1) Data Structures using C & C++, Yedidyah Langsam, Moshe J. Augenstein, Aaron M. Tenenbaum 2nd

Edition, Pearson education , 2015

UE19CS203: STATISTICS FOR DATA SCIENCE (4–0–0–4)

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

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.	21.43	21.43
2.		**Sampling:** Introduction, Sample, Population, Types of population – Tangible, Conceptual. (1.1),		
3.		Sampling Methods (1.1)		
4.		Types of Data, Types of Experiments – Controlled and Observational study (1.1), Sampling Errors – Handout		
5.		**Getting and Analyzing Data:** Scraping the Web, Reading Files (.csv) (Handout)		
6.		**Data Cleaning:** Need for Data Cleaning, Basics of Data Cleaning.(Handout)		
7.		**Statistics :** Introduction, Types of Statistics, Summary Statistics(1.2)		
8.		Summary Statistics (cont.), Statistic and Parameter.(1.2)		
9.		**Data Visualization and Interpretation : Graphical summaries -** Histogram – Equal and Unequal Widths (1.3)		
10.		Visualizing Data: Box Plots (1.3)		
11.		Visualizing Data: Two variables (Scatter Plots) (1.3), Bar Charts – Handout, Heat Maps-Handout		
12.		Good vs. Bad Visualization.(Handout)		
13.		Brief overview of Probability Basics.(Handout)(Self Learning)	21.43	42.86

		Random Variables : Introduction, Discrete Random Variables(2.4)		
14.		Continuous Random Variables(2.4)		
15.	**Unit: 2**	Linear Functions of Random Variables.(2.5)		
16.	**Random Variables and Probability Distributions**	**Probability Distributions:** The Bernoulli Distribution(4.1)		
17.		Linear Functions of Random Variables.(2.5)		
18.	**T1: Chapter 2 2.4 – 2.5, Chapter 4 4.1 – 4.3, 4.5**	The Binomial Distribution(4.2)		
19.		The Poisson Distribution(4.3)		
20.		The Normal Distribution(4.5)		
21.		The Normal Distribution(4.5)		
22.		Chebyshev's inequality(2.4),Derivation of Distributions: Bernoulli Distribution(Handout), Binomial Distribution(Handout)		
23.		Generation of Random Variates (Handout)		
24.		Generation of Random Variates(Handout)		
25.		Principles of Point Estimation : Mean squared error(4.9)	21.43	64.29
26.		Maximum likelihood estimate (4.9)+(Handout)		
27.	**Unit: 3**	Maximum likelihood estimate (4.9)+(Handout)		
28.	**Probability Distributions and Confidence Intervals**	Normal Probability Plot (4.10)		
29.		**Sampling concepts :** The Central Limit Theorem and its applications(4.11)		
30.	**T1: Chapter 4 4.9 – 4.11 Chapter 5 5.1-5.4, 5.7**	The Central Limit Theorem Applications.(4.11)		
31.		**Confidence Intervals :** Introduction, Interval estimates for proportion of large samples. (5.2)		
32.		Confidence intervals for mean of Small Samples.(5.3) Student's t Distribution		

33.		Confidence Intervals for the Difference Between Two Means for large samples(5.4), Confidence Interval estimates for paired data.(5.7)		
34.		Factors affecting Margin of Error.(Handout)		
35.	**Unit: 4** **Hypothesis and Inference.** **T1: Chapter 6** **6.1 – 6.3, 6.5, 6.9, 6.10, 6.12**	**Hypothesis Testing:** Introduction (6.1)	17.85	82.14
36.		Large sample tests for a Population Mean (6.1)		
37.		Large sample tests for a Population mean (6.1) C**ontd.**		
38.		Drawing conclusions from the results of Hypothesis tests(6.2)		
39.		Drawing conclusions from the results of Hypothesis tests(6.2)**contd.**		
40.		Large sample tests for a Population proportion (6.3)		
41.		Large - Sample tests for Difference between two means(6.5)		
42.		Distribution Free Tests.(6.9)		
43.		Chi-squared Test.(6.10)		
44.		Chi-squared Test.(6.10)		
45.		Fixed Level Testing (6.12)		
46.		Type I and Type II Errors (6.12)		
47.	**Unit: 5** **Power of Test** **T1: Chapter 6** **6.13** **Simple Linear Regression.** **T1: Chapter 7** **7.1 – 7.4**	Power of a Test.(6.13)	17.85	100
48.		Power of a Test.(6.13)		
49.		Factors affecting Power of a Test.(Handout)		
50.		**Simple Linear Regression:** Introduction**,** Correlation.(7.1)		
51.		Correlation.(7.1), The Least squares Line.(7.2)		
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.**		

Textbook(s):

1) Statistics for Engineers and Scientists, William Navidi. 4th edition, McGraw Hill Education, India, 2013

Reference(s):

1) The Art of Computer Systems Performance Analysis: Techniques for Experimental Design, Measurement, Simulation, and Modeling, Raj Jain, Wiley , 2008
2) Data Science From Scratch, Joel Grus 1st edition, O'Reilly, 2015
3) Sampling- Design and Analysis, Sharon L. Lohr, 2nd edition, Cengage, 2010
4) Statistics for Engineers and Scientists, William Navidi, 3rd edition, McGraw Hill Education, India, 2010

UE19CS204 : WEB TECHNOLOGIES (4:0:0:0:4)

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

Class #	Chapter Title/Reference Literature	Topics to be Covered	% of Portions Covered	
			% of Syllabus	Cumulative %
1.	**UNIT 1 T1 (Chap. 1,13-15, 19, 20)**	Introduction to WWW & Web protocols, HTTP Request Response Formats, URLs	**17%**	**17%**
2.		Basic Mark-ups & syntax, HTML elements & attributes		
3.		Web Form 2.0 & Form Controls		
4.		CSS3.0-Styles and Style sheets, Selectors,		
5.		Style properties, Box Model		
6.		JavaScript Basics (Syntax, Datatypes)		
7.		JavaScript Arrays, Functions and Hoisting		
8.		JavaScript Builtin Objects		

9.		JavaScript Objects		
10.		JavaScript Object Inheritance		
11.	**UNIT 2** **T1 (Chap. 21, 23-26)**	DOM Manipulations	**22%**	**39%**
12.		Events		
13.		Event Handling in JavaScript		
14.		XML Vs JSON (with parsing) HTML5 (input types/placeholder/required, New Semantic Tags)		
15.		Audio, Video, Progress		
16.		Canvas, SVG		
17.		geolocation, web workers		
18.		JQuery (Introduction, Selectors, Actions)		
19.		JQuery (Handling events and effects)		
20.		Callbacks & Promises		
21.		Single Page Application, Asynchronous Communication- XHR (properties and methods)		
22.		$.ajax, $.get, $.post, fetch( )		
23.	**UNIT 3** **T2 (Chap. 1, 3, 4, 8)**	MERN Introduction	**22%**	**61%**
24.		React installation and application setup, JSX		
25.		React Classes and Components		
26.		Properties,States and Context		
27.		Properties,States and Context		
28.		Component lifecycle methods		
29.		Refs & Keys		
30.		Event Handling		

31.		React Router		
32.		Stateless components		
33.		React form & controls		
34.		React form & controls		
35.	**UNIT 4** **T2 (Chap. 2, 6)**	Understanding Node JS Architecture	**17%**	**78%**
36.		NPM Installation and Features		
37.		Set up Node JS app		
38.		HTTP methods and Verbs		
39.		Buffers, Streams, File system		
40.		Callbacks, QueryString		
41.		Mongo DB- Documents, Collections		
42.		Reading and Writing to DB		
43.		MongoDB Node JS Driver		
44.		Running a react application on NodeJS(Hands-on)		
45.	**UNIT 5** **T2 (Chap. 5)**	Introduction to Web services and REST API's	**22%**	**100%**
46.		Express Installation and Server setup and Building the application stack		
47.		Routing		
48.		List API, Create API		
49.		List API, Create API		
50.		Error Handling and Express Middleware		
51.		Express Scaffolding and Templates		
52.		Cookies & fileupload		

53.		Guest Lecture / Project Evaluation		
54.				
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□				

Textbook(s):

1) **Learning PHP, MySQL & JavaScript, by Robin Nixon; ISBN: 9781491978917, 5th Edition,** O'Reilly Media, 2018
2) Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node by Vasan Subramanian, Apres,s 2017

Reference(S):

1) Beginning Node.js, Express & MongoDB Development by Greg Lim , McGraw Hill, 2017
2) Learning React, Functional Web Development with React and Redux By Alex Banks and Eve Porcello, O'Reilly Media, 2017

UE19CS205 : Automata Formal Language and Logic: 4:0:0::04

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

Hours	Unit	Topic	Chapter & Section	% Coverage	
				Unit	Total
1	1	Mathematical Preliminaries	T1-1.1	18	18
2		Basic Notations	T1-1.2		
3		Deterministic Finite Acceptors	T1-2.1		
4					
5					
6					
7		Non -Deterministic Finite Acceptors, λ-NFA	T1-2.2		

8		Equivalence of Deterministic and Non-deterministic Finite Acceptors	T1-2.3		
9		Reduction of the number of states in Finite Automata(Minimization of DFA)	T1-2.4		
10					
11	2	Regular Expressions	T1-3.1	18	36
12					
13		Connection between Regular Expressions Regular Languages	T1-3.2		
14					
15		Regular Grammars	T1-3.3		
16					
17		Properties of Regular Languages	T1-4.1, 4.2		
18		Pumping Lemma and identifying Non–Regular Languages	T1-4.3		
19					
20					
21	3			21.3	57.3
22		Context Free Grammars	T1-5.1		
23		Parsing and Ambiguity	T1-5.2		
24		Formal Definitions of Pushdown Automata	T1-7.1		
25					
26		Deterministic Pushdown Automata	T1-7.3		
27		Non Deterministic Pushdown Automata	T1-7.1		
28					
29		Methods for Transforming Grammars	T1-6.1		

30		Two important Normal Forms	T1-6.2		
31		A Membership Algorithm for Context–Free Languages	T1-6.3		
32		Pushdown down Automata and Context Free Languages	T1-7.2		
33	4	Properties of Context–Free Languages	T1-8.2	21.3	78.6
34		Pumping Lemma for Context–Free Languages	T1-8.1		
35		The Standard Turing Machine	T1-9.1		
36					
37		Combining Turing Machine for Complicated Tasks	T1-9.2		
38		Turing Thesis	T1-9.3		
39		Recursive and Recursively Enumerable Languages	T1-11.1		
40		Context Sensitive Grammar and Languages	T1-11.3		
41		The Chomsky Hierarchy	T1-11.4		
42		Some Problems that Cannot be solved by Turing Machine, PCP	T1-12.1, 12.3		
43					
44		Undecidable Problems for Recursively Enumerable Languages	T2-12.2		
45	5	Propositional Logic : A very simple logic	T2-7.4	21.4	100
46		Syntax	T2-7.4.1		
47		Semantics	T2-7.4.2		
48		A simple knowledge Base	T2-7.4.3		
49		A simple Inference procedure	T2-7.4.4		
50		Inferences and Proofs	T2-7.5.1		
51					

52		Proof by resolution	T2-7.5.2		
53		First Order Logic : Syntax and Semantics of First order logic	T2-8.2		
54					
55		Numbers, Sets and Lists	T2-8.3.3		
56		Example - The electronic circuit Domain	T2-8.4.2		

Text Book(s):

1. "An Introduction to Formal Languages and Automata", Peter Linz, Jones and Bartlett, New Delhi, India, 5th Edition, 2011.
2. Artificial Intelligence – A Modern Approach", Stuart Russell and Peter Norvig, Pearson, 3rd Edition (Paperback),2016

References:

1. "Theory of Computation", Michael Sipser, Cengage Learning, New Delhi, India, 2008.
2. "Introduction to Automata Theory, Languages, and Computation", John E Hopcroft, Rajeev Motwani, Jeffrey D Ullman, Pearson Education, New Delhi, India, 3rd Edition, 2009.
3. "Theory of Computation: A Problem–Solving Approach", Kavi Mahesh, Wiley India, New Delhi, 2012.