Computer Science And Engineering
(Jan – May, 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.

IV SEMESTER (2018-2022)

Sl. No.	Course Code	Course Title	Hours per week				Credits	Course Type
			L	T	P	S		
1	UE18MA251	Linear Algebra and Its Applications	4	0	0	0	4	FC
2	UE18CS251*	Design and Analysis of Algorithms	4	0	0	0	4	CC
3	UE18CS252	Database Management Systems	3	0	0	0	3	CC
4	UE18CS253	Microprocessor and Computer Architecture	4	0	0	0	4	FC
5	UE18CS254	Theory of Computation	3	0	0	0	3	CC
6	UE18CS255	Design and Analysis of Algorithms Laboratory	0	0	2	0	1	CC
7	UE18CS256	Microprocessor and Computer Architecture Laboratory	0	0	2	0	1	FC
8	UE18CS257 X	Special Topic II	0 /2	0	0 /4	0/8	2	PW
9	UE19MA151D	Engineering Mathematics –II (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								

UE18MA251 - LINEAR ALGEBRA (4-0-0-0-4)

of Credits: 4

Class No.	Portions to be covered	Percentage of Syllabus Covered
1	Introduction to Linear Algebra	**20**
2-3	The Geometry of Linear Equations – Row and Column Pictures	
4	Singular cases in two and three dimensions	
5-6	Gaussian Elimination, The breakdown of elimination	
7	**Scilab Class Number1 – Gaussian Elimination**	
8	Elementary Matrices	
9-10	Triangular Factors and Row Exchanges	
11-12	Inverse by Gauss -Jordan Method, Transposes	
13-14	**Scilab Class Number 2&3- LU Decomposition and Inverses**	
15-17	Vector Spaces and Subspaces (Definition only), Column Space and Null Space, Examples	**40**
18-20	Echelon Form, Row Reduced Form, Pivot Variables , Free variables	
21-24	Linear Independence, Basis and Dimensions	
25	**Scilab Class Number 4 – Span of Column Space of A**	
26-27	The Four Fundamental Subspaces	
28	Existence of Inverses	
29	**Scilab Class Number 5 –Four Fundamental Subspaces of A**	
30-31	Linear Transformations , Examples	**60**
32-33	Transformations Represented by Matrices	
34-35	Rotations, Reflections and Projections	
36-38	Orthogonal Vectors and Subspaces	
39-40	Cosines and Projections onto Lines	
41-42	Projections and Least Squares	
43	**Scilab Class Number 6-Projections by Least Squares**	
44-46	Orthogonal Bases- Orthogonal Matrices, Properties, Rectangular Matrices with orthonormal columns	**80**
47-50	The Gram- Schmidt Orthogonalization, A = QR Factorization	
51	**Scilab Class Number 7- The Gram- Schmidt process**	
52-54	Introduction to Eigen values and Eigenvectors, Properties of eigenvalues and eigenvectors, Power Method to compute the largest eigenvalue	
55-56	Diagonalization of a Matrix, Powers and Products of Matrices	

57-58	**Scilab Class Number 8&9- Eigen Values and Eigen Vectors, The Power Method**	
59-60	Positive Definite Matrices - Tests for Positive Definiteness	**100**
61-62	Positive Definite Matrices and Least Squares, Semi definite Matrices	
63-67	The Singular Value Decomposition of a Matrix, Examples	
68	Applications of SVD	
69-70	**Scilab – In Semester Assessment**	

UE18CS251 - DESIGN AND ANALYSIS OF ALGORITHMS (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 %
1	**Unit #1** **T1: Chapters 1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 2.4**	The motivation for the course. Scheme of the course. Introduction to Algorithms.	**16.07**	**16.07**
2		Fundamentals of Algorithmic problem-solving. Important problem types – sorting, searching.		
3		Important problem types – string processing, graph problems, Combinatorial, Geometrical, numerical problems		
4		Analysis Framework, Orders of Growth		
5		Asymptotic Notations		
6		Basic Efficiency Classes		
7		Analysis of Non-recursive Algorithms		
8		Analysis of Recursive Algorithms		
9		Solving Recurrences of Recursive Algorithms		
10	**Unit #2** **T1: Chapters 3.1, 3.2, 5.2, 3.4, 5.1, 5.3, 5.4,**	Brute-Force approach and Sequential Search	**23.22**	**39.29**
11		Brute-Force String Matching		
12		Selection Sort and Bubble Sort		
13		Exhaustive Search – Travelling Salesman Problem		
14		Knapsack Problem, Assignment Problem		
15		Recursion		
16		Decrease-and-Conquer approach - Insertion Sort		

17	**5.5**	Depth First Search		
18		Breadth First Search		
19		Topological Sorting		
20		Algorithms for Generating Combinatorial Objects		
21		Johnson Trotter Algorithm		
22		Decrease-by-a-Constant-Factor Algorithms		
23	**Unit #3** **T1: Chapters 4.1, 4.2, 4.3, 4.4, 4.5, 6.1, 6.3, 6.4, 7.4**	Divide-and-Conquer approach with Mergesort	**19.64**	**58.93**
24		Quicksort		
25		Binary Search		
26		Multiplication of Large Integers		
27		Strassen's Matrix Multiplication		
28		Transform-and-Conquer approach - Presorting		
29		Heapsort		
30		Balanced Search Trees - AVL Trees		
31		AVL Tree Construction		
32		2-3 Trees		
33		B Trees		
34	**Unit #4** **T1: chapters 7.1, 7.2, 12.1, 12.2, 9.1, 9.2, 9.3, 9.4**	Space and Time Tradeoffs - Sorting by Counting	**19.64**	**78.57**
35		Distribution Counting Sort		
36		Input Enhancement in String Matching – Horspool's algorithm		
37		Boyer-Moore Algorithm		
38		Backtracking: N queens Problem, Hamiltonian circuit Problem		
39		Branch-and-Bound: Knapsack Problem, Travelling Salesman Problem		
40		Greedy Approach		
41		Prim's Algorithm		
42		Kruskal's Algorithm		
43		Dijkstra's Algorithm		
44		Huffman trees		
45	**Unit #5** **T1: chapters 8.1, 8.4, 8.2, 11.1, 11.2, 11.3**	Dynamic Programming approach	**21.43**	**100**
46		Examples of Dynamic Programming		
47		Computing a Binomial Coefficient		
48		Knapsack problem and Memory Functions		
49		Problem: All-pairs Shortest-paths		
50		Floyd's Algorithm		
51		Problem: Finding Transitive Closure		
52		Warshall's Algorithm		
53		Lower Bound Algorithms		
54		Decision Trees		
55		P, NP and NP Complete problems		

56		Coping with the limitations of Algorithm Power		

Literature:

Book Type	Code	Title & Author	Publication Information		
			Edition	Publisher	Year
Text Book	T1	*Introduction to The Design and Analysis of Algorithms* Anany Levitin	2	Pearson	2011
Reference Book	R1	*Introduction to Algorithms* Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein	3	Prentice-Hall India	2009
Reference Book	R2	Horowitz, Sahni, Rajasekaran, *Fundamentals of Computer Algorithms*	2	Universities Press	2007
Reference Book	R3	Jon Kleinberg, Eva Tardos, *Algorithm Design*	1	Pearson Education	2006

UE18CS252 – DATABASE MANAGEMENT SYSTEMS (3-0-0-0-3)

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

Class #	Reference Literature	Topics	% of Portion covered	
			% of Syllabus	Cumulative %
Unit #1 - Introduction to Database and Conceptual Design using ERD			**19**	**19**
1	**T1: 1.1 – 1.6 RA: T1 1.7 – 1.8**	Introduction to Databases		
2	**T1: 2.1 –2.3**	Data models, Three-Schema Architecture and Data Independence, Database Languages and Interfaces		
3	**T1: 2.4 – 2.6**	Database system environment, Centralized and Client/Server architectures, Classification of database management system		
4	**T1: 3.1 – 3.3**	Conceptual Model, Entity types, attributes and keys		
5	**T1: 3.4**	Relationship types, sets, roles		
6	**T1: 3.5 –**	Weak Entity, Refining the ER design,		

	3.7	ER diagrams		
7	**T1: 3.9**	Relationship Types of degree higher than two		
8	**T1: 3.10**	Example: University database		
	Assignment 1	Laboratory exercise 3.34		
Unit #2 - Relational Model				
9	**T1: 5.1**	Relational Model concepts		
10	**T1: 5.2**	Relational model Constraints and relational Database Schemas		
11	**T1: 5.3**	Update operations, Transactions and dealing with constraint violations		
12	**T1: 9.1**	Relational Database Design Using ER-to Relational Mapping		
13	**T1: 8.1**	Unary Operations - SELECT and PROJECT	**19**	**38**
14	**T1: 8.2**	Set Theory Operations		
15	**T1: 8.3**	Binary Relational Operations - JOIN, DIVISION		
16	**T1: 8.4 – 8.5**	Aggregate Functions and Grouping		
	Assignment 2	T1: Exercise 8.17		
Unit #3 - SQL			**24**	**62**
17	**T1: 6.1**	SQL Data Definition, Primary Data Types, Advanced Data Types like CLOB, BLOB		
18	**T1: 6.2**	Specifying Constraints in SQL		
19	**T1: 6.3 – 6.5**	Basic Retrieval Queries, Insert, Delete, Update		
20				
21				
22	**T1: 7.1**	Advanced SQL Queries, Other SQL Constructs : WITH, CASE, Outer joins		
23				
24	**T1: 7.2 – 7.4**	Specifying General Constraints as Assertions and Triggers, Views and Schema Change Statements in SQL		
25	**T1: 19.9 RA: T1 17.1, 17.6 – 17.7**	Additional Features of SQL – performance, execution plan		
26	**T1: 10.1 – 10.4**	Database Programming		
	Assignment	Exercise T1: 10.12		

	3			
Unit #4 - Database Design			**19**	**81**
27	**T1: 14.1**	Informal Design Guidelines for Schemas		
28	**T1: 14.2**	Functional Dependencies		
29	**T1: 15.1**	Inference Rules, Closure		
30	**T1: 15.1.2 – 15.1.3**	Equivalence, Minimal Cover		
31	**T1: 15.2**	Properties of Relational Decompositions		
32	**T1: 14.3**	Normal Forms Based on Primary Keys (1st, 2nd and 3rd NF), General Definitions of Second and Third Normal Forms		
33	**T1: 14.4**			
34	**T1: 14.5 – 14.7**	Boyce-Codd Normal Form, Overview of Higher Normal Forms		
	Assignment 4	Exercise T1: 14.32		
Unit #5 - DBMS Architecture and Database Security			**19**	**100**
35	**T1: 30.1 – 30.3**	Database Security (CREATE USER, ROLE, GRANT and REVOKE)		
36	**T1: 20.1, 20.3 RA – T1: 20.4 – 20.5**	Transactions - ACID Properties, schedules		
37	**T1: 20.6**	SQL commands for database transactions (BEGIN, END, COMMIT, SAVEPOINT, ROLLBACK)		
38	**T1: 21.1, 21.2**	Concurrency, Locking, Deadlocks - Detection and Prevention		
39	**T1: 22.1 -22.2**	Crash Recovery		
40	**T1:23.1**	Overview of parallel and distributed databases		
41	**T1: 24.1 – 24.3**	NoSQL databases		
42	**T1: 24.4 – 24.6**			

Literature:

Book Type	Code	Title & Author	Publication Information		
			Edition	Publisher	Year
Text Book	T1	Fundamentals of Database Systems - Ramez Elamsri, Shamkant B Navathe	7th	Pearson	2017
	T2	Database Management Systems - Johannes Gehrke, Raghu Ramakrishnan	3rd	McGraw-Hill	2003
Reference Book	R1	Database Systems: The Complete Book - Garcia-Molina, J D Ullman, Widom	2nd	Prentice-Hall	2008
	R2	Database System Concepts - Silberschatz, H Korth, S Sudarshan	6th	McGraw-Hill	2010

UE18CS253 - MICROPROCESSOR AND COMPUTER ARCHITECTURE

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

Class #	Chapter Title / Reference Literature	Topics to be Covered	% of portions covered	
			Reference Chapter	Cumulative
UNIT 1: Introduction to Microprocessor, & ISA (10 hours)				
1	**1.6,2.3 of T2, A-3 of T1, pg no: 51-55 of T2 Chapter 3.1 to 3.5 of T3 6.8,5.6 of T2**	Introduction -Overview of Microprocessor : Evolution and Introduction to INTEL Processor	**20%**	**20%**
2		ISA – Classification, RISC and CISC		
3		Memory Addressing-Interpreting memory addresses , addressing modes		
4		Addressing Modes		
5		Type and size of operands		
6		Instruction set-operations		
7		Instruction set-operations		
8		Instruction set-operations		
9		Instruction set-operations		
10		Instruction Encoding		
11		Instruction Encoding		
12		Case Study- ARM/MIPS/X86 Processor		
UNIT 2 Pipelining (12 hours)				

13	**4.1,4.2 of Text T2** **Appendix C-1, C-2, Sec 1.1 , 1.4, 1.5 of T1**	Introduction to Pipelining, 3 stage pipelining	**20%**	**40%**
14		5 stage pipelining		
15		Pipeline hazards		
16		Structural Hazards		
17		Data Hazards .		
18		Data Hazards continued..		
19		Data hazards		
20		Control hazards- what is a control hazard, prediction algorithms- static, dynamic		
21		Static branch prediction		
22		Dynamic branch prediction		
23		Dynamic branch prediction		
24		Dynamic Branch predication		
UNIT 3: Memory Hierarchy (10 Hours)				
25	**Appendix B.1, B.2, B.3 of T1**	Trends in technology, power & energy in Integrated Circuits	**20%**	**60%**
26		Introduction to Memory Hierarchy		
27		Fully Associative Cache Memory		
28		Direct Map Cache Memory		
29		Set Associative Cache Memory		
30		Cache Performance Problems		
31		Cache Performance Problems		
32		Basic cache Optimizations		
33		First & Second optimizations		
34		First & Second optimizations		
35		Third & Fourth Optimizations		
36		Third & Fourth Optimizations		
UNIT 4 : Cache Optimizations and Parallel Architecture (10 Hours)				
37	**Appendix B.3 of T1** (Reference Material to be Provided)	cache Optimization 5	**20%**	**80%**
38		Cache Optimization 5		
39		Cache Optimization 6		
40		Cache Optimization 6		
41		Introduction to I /O		
42		Introduction to parallel architecture		
43		Parallel programming models		
44		Memory architecture		
45		Memory architecture		
46		Amdahl’s Law		
47		Gustafson’s Law		
UNIT 5 : Advances in Architecture (10 Hours)				

48	**Chapter 3 of T1(3.1,3.2 ,3.4,3.5 and 3.10) (Reference material to be provided)**	Introduction to Instruction Level Parallelism (ILP)	**20%**	**100%**
49		Scheduling policies for ILP		
50		Scheduling policies for ILP		
51		Dynamic Scheduling schemes		
52		Limitations of ILP		
53		Multicore architecure		
54		Multicore architecture continued		
55		Multicore architecure		
56		Revision		

Literature:

Book Type	Code	Title & Author	Publication Info		
			Edition	Publisher	Year
Text Book	T1	Hennessy Patterson	Fifth Edition	MK Morgan Kaufmann	2012
Text Book	T2	ARM System on Chip, Steve Furber	Second Edition,	Pearson Education	2000
Text Book	T3	ARM System Developer's Guide	Reprint 2009	Elsevier	2009

UE18CS254 – THEORY OF COMPUTATION

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

Class #	Unit	Topic	Chapter & Section	% Coverage	
				Unit	Total
1	1	Introduction: Computers, computation, computability and Languages	T1- 1.2 T2 - 1.1, 1.2, 1.3, 1.7, 1.8	**21.15**	**21.15**
2		Deterministic Finite Automata: Definition, start state, final state, internal states, Language of DFA, construction of DFA and string acceptance	T1 – 2.1 T2 - 2.1 – 2.3, 2.9		
3					
4		Non–Deterministic Finite Automata	T1 – 2.2 T2 - 2.12, 3.1 – 3.2		
5					
6		Equivalence of Deterministic and Non–Deterministic	T1 - 2.3		

7		Finite Automata			
8		Minimizing Finite Automata	T2- 3.5		
9	2	Regular Expressions, Construction of Regular Expressions	T2- 4.1 – 4.4, 4.7, 4.9	**19.23**	**40.38**
10		Equivalence of RegEx & Finite Automata	T2 - 4.5 – 4.6		
11					
12		Regular Grammars	T2 - 5.1 – 5.3		
13		Equivalence of Regular Grammar & Finite Automata	T2 - 5.4 – 5.7		
14					
15		Closure Properties of Regular Languages	T2 - 6.1 – 6.2		
16		Pumping Lemma and identifying Non–Regular Languages	T2 - 6.3 – 6.4		
17	3	Context–Free Languages	T2 - 7.1 – 7.2	**21.15**	**61.53**
18		Constructing Context–Free Grammars: Linear & Non – linear	T2 - 7.3 – 7.5		
19					
20		Parsing and Ambiguity	T2 - 7.6 – 7.8		
21					
22		Non–Deterministic Pushdown Automata, Constructing Pushdown Automata	T1 - 7.1 T2 - 8.1 – 8.4, 8.7		
23					
24					
25		Equivalence of Push Down Automata and Context Free Grammars, Conversion CFG to PDA	T1 - 7.2		
26	4	Deterministic Pushdown Automata and Deterministic Context–Free Languages	T1 – 7.3	**21.15**	**82.68**
27		Conversion to Chomsky Normal Form, A Membership Algorithm for Context–Free Languages	T1 – 6.3 T2 - 7.10		
28					
29		Greibach Normal Form	T2 – 7.11		
30		Closure Properties Context Free Languages	T2 - 9.1 – 9.4		
31		Pumping Lemma for Context–Free Languages	T2 - 9.5 – 9.6		
32					
33	5	The Standard Turing Machine	T2 - 10.1 –		

34			10.3		
35		Constructing Turing Machines	T2 - 10.4 – 10.5		
36					
37					
38		Church–Turing Thesis , Universal Turing Machine	T2 - 10.7, 10.9	**17.32**	**100**
39		Recursive and Recursively Enumerable Languages	T2 - 11.1 – 11.8, 11.13		
40		Diagonalization, Chomsky hierarchy			
41		Post Correspondence Problem, The Halting Problem of Turing Machines	T2 - 12.1, 12.3		
42		Undecidable Problems	T2 - 12.7		

UE18CS255 – DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY

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

Laboratory Title	**Design and Analysis of Algorithms Laboratory** (UE18CS255)
For the Class	B. Tech. 4th Semester 2018-2022 batch
Preamble	Design and Analysis of algorithms is core to computer science and engineering. It is important in designing algorithms to solve different types of problems. The laboratory includes implementation of problem statements with respect to various algorithmic strategies such as Divide and Conquer, Decrease and Conquer, Greedy and Dynamic Programming techniques.
Objective	Understand the algorithm design techniques including Brute Force, Divide and Conquer, Decrease and Conquer, Transform and Conquer, Dynamic Programming and Greedy technique. Make Space and Time Tradeoffs while designing algorithms. Analyze the algorithms with absolute running time of the algorithm implementations and compare it with the asymptotic complexity classes of the algorithms.
Outcome	Design and implement algorithms of Brute Force Technique. Design and implement algorithms with Divide and Conquer technique. Design and implement algorithms with Decrease and Conquer and Transform and Conquer techniques. Design and implement algorithms with Space and Time Tradeoffs. Design and implement optimization algorithms using Dynamic Programming and Greedy technique.

Session	Tasks
1	Introduction to Algorithms laboratory and Implementation of Sequential search
2	Implementation of Naïve string matching algorithm
3	Implementation of Bubble sort and Selection sort algorithm with time computations
4	Implementation of exhaustive travelling sales person problem.
5	Implementation of insertion sort and comparison of sorting algorithms
6	Implementation of DFS and BFS related problems
7	Implementation of merge sort and binary search algorithm with time computations
8	Implementation of quick sort algorithm with time computations
9	Implementation of Heap sort with time computations
10	Implementation of horspool's string matching algorithm
11	Implementation of Backtracking and branch and bound based travelling sales person problem
12	Implementation of Dijkstra's algorithm
13	Implementation of floyd's and warshall's algorithm

UE18CS256 – MICROPROCESSOR AND COMPUTER ARCHITECTURE LABORATORY

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

Laboratory Title	Microprocessor & Computer Architecture Laboratory (UE18CS256)
For the Class	B. Tech. 4th Semester 2018-2022 batch
Preamble	Microprocessor & Computer Architecture Laboratory is a core course and complements the theory course in Microprocessor & Computer Architecture. In the theory course, the students study ARM and MIPS architecture and Instruction set. In the lab course, the students implement assembly language programs and sensor based project using Arduino microcontroller.
Objective	• Implement assembly language programs and develop strong competencies in contemporary ISAs. • Develop, edit, compile and debug assembly language programs using present - day simulators. • Know various addressing modes that are defined in a given instruction set architecture and illustrate how machine language instructions in that architecture identify the operand(s) of each instruction. • Practice interfacing experiments using various sensors with Arduino board. • Learner to imbibe the skills of formulation of a complex problem, design a suitable solution using Arduino/ Raspberry Pi processors and demonstrate the end results.
Outcome	At the end of the course, the student will be able to: • Inculcate the importance of instruction set architecture and their fundamental concepts using assembly language programming. • Demonstrate editing, compiling, executing and debugging an assembly

	language program of a contemporary microprocessor. • Demonstrate the usage of subroutines and recursion supported by the ISA. • Imbibe strong assembly language programming skills by implementing solutions to problems using simulators. • Instilling the idea to formulate a complex problem definition, approach to solve the problem, methodology to apply and implement suitable algorithm and check for the final results.

Session	Tasks
1	Introduction to Instruction Set – ARM Processor. Sample programs using Simulator.
2	Programs on ARM/ x86 using Simulator.
3	Programs on ARM/ x86 using Simulator.
4	Demonstration of Arduino Microcontroller with various sensors, Project Discussion.
5	Project Discussion (Playing Previous year Video) for Half an Hour. Project Title confirmation.
6	Programs on ARM/ x86 using Simulator.
7	Introduction to 3 stage Pipeline using simulator and Pluggins.
8	Introduction to 5 stage Pipeline (case study: Hazards using Simulator - RAW, WAR, WAW).
9	Cache Memory Demonstration.
10	Mini Project
11	Mini Project
12	Mini Project
13	Project Evaluation

UE18CS257X - MATLAB FOR IMAGE PROCESSING (2-0-0-0-2)

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

Class	CHAPTER TITLE/REFERENCE LITERATURE	UNIT NO	TOPICS TO BE COVERED	% OF PORTIONS COVERED	
				REFERENCE CHAPTER	CUMULATIVE
1	**Chapter 1: Introduction and Fundamentals**	I	MATLAB's Power of Computational Mathematics, Features of MATLAB	**17.85**	**17.85**
2-3			Uses of MATLAB, Basic Syntax, variables, commands		
4-5			data types, operators, m - files		
6-7	**Chapter 2: Programming using MATLAB**	II	Decision making, loops, matrix operations: scalar operations,	**21.42**	**39.27**
8-9			transpose, determinant, Inverse, concatenation, vectors, arrays, colon notation, strings, functions		
10-11			**Project**: Image Interpolations using loops, Image Smoothing		
12-13	**Chapter 3,10,11: Image Processing**	III	Acquiring and Importing Data, Image Enhancement	**21.42**	**60.69**
14-15			Image Deblurring, Edge Detection		
16-17			Image Segmentation **Project**: Filling gaps in the text using Morphological Processing		
18-21	**MathWorks, Compter**	IV	Funtions for Video Processing using Computer Vision Toolbox VideoReader(), VideoWriter() etc.	**21.42**	**82.11**

22-23	**Vision Tool Box:** **Video Processing functions** (Reference Material/ Links will be provided)		Using Video Processing functions extracting Frames from video **Project:** Face Feature Detection		
24-25	**MathWorks, Compter Vision Tool Box:** **Case study** (Reference Material/ Links will be provided)	V	Object Detection and Recognition	**17.89**	**100**
26-28			Object Tracking and Motion Estimation		

Literature:

Reference books	Title & Author	Publication Info	
		Edition	Year
1	Digital Image Processing using MATLAB, Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins	2nd Edition	2009

UE18CS257X - ANDROID APPLICATION DEVELOPMENT (2-0-0-0-2)

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

Class #	Chapter Title/Reference Literature	Unit #	Topics to be Covered	% of Portions Covered	
				% of Syllabus	Cumulative
1	**Android Programming, Activities, Fragments, and Intents:**	I	**Android Programming**: Introduction to Android, Required Tools, Anatomy and Creation of First Android Application, Using the Android Emulator	**20**	**20**
2			**Activities**: Understanding Activities		
3			**Intents**: Linking Activities Using Intents		
4			Calling Built-In Applications Using Intents		
5			Fragments		
6			Displaying Notifications		
7	**User Interface, Designing User Interface with Views**	II	**User Interface**: Understanding the Components of a Screen, Adapting to Display Orientation	**21**	**41**
8			Managing Changes to Screen Orientation, Utilizing the Action Bar		
9			Creating the User Interface Programmatically, Listening for UI Notifications		
10			**Designing User Interface with Views:** Using Basic Views, Using Picker Views		
11			Using List Views to Display Long Lists		
12			Menu		
13	**Data Persistence, Content Providers**	III	**Data Persistence**: Saving and Loading User Preferences	**25**	**66**
14			Persisting Data to Files		
15			Creating and Using Databases		
16			**Content Providers**: Sharing Data in Android		
17			Using a Content Provider		
18			Creating Your Own Content Providers		
19			Using the Content Provider		

20	**Messaging, Android Services**	IV	**Messaging**: SMS Messaging, Sending E-mail Services in Android	**19**	**85**
21			**Android Services**: Types of Services: Local Service, Remote Service, Intent Service.		
22			Broadcast Receivers, Types of Broadcasts		
23			Creating a Broadcast Receivers		
24			Introducing Notifications		
25	**Location Based Services, Publishing Android Applications**	V	**Location Based Services**: Location-Based Services, Configuring the Emulator to Test Location-Based Services	**15**	**100**
26			Updating Locations in Emulator Location Providers		
27			Selecting a Location Provider, Finding Your Location,		
28			**Publishing Android Applications:** Preparing for Publishing, Deploying APK Files		

Literature:

Reference books	Title & Author	Publication Info	
		Edition	Year
1	Beginning Android Application development", Wei-Meng Lee, Wiley Publishing,	1	2011
2	Professional Android 2 Application Development by Reto Meier, Wiley Publishing, 2010	1	2010
3	Android 4.2 App Development Essentials, Neil Smyth	1	2013
4	The Busy Coder's Guide to Android Development, Mark L. Murphy	1	2009

Computer Science And Engineering
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UE18CS257X - SECURED PROGRAMMING WITH C (2-0-0-0-2)

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

Class #	Chapter Title / Reference Literature	Topics to be covered	% of Portions Covered	
			% of Syllabus	Cumulative %
	Unit #1	**Introduction**	**21.42**	**21.42**
1	**Introduction**	Need for Secure Programming,		
2	**T1: Chapter 1: Set-UID Programs Chapter 2: Environment Variables and Attacks**	Set- UID Programs: Set-UID Mechanism, what can go wrong,		
3		Attack Surfaces of Set-UID Programs, Invoking other programs, Principle of Least Privilege;		
4		Environment variable and attacks:		
5		Attack surface, Attack via External Program,		
6		Case study		
	Unit #2	**Integer Security**	**17.86**	**39.28**
7	**Integer Security**	Integer- Unsigned Integers		
8		Integer security, Representation,		
9		Conversions, Operations;		
10	**T2: Chapter 5: Integers**	Signed Integers- Operations		
11		Vulnerabilities, Mitigation strategies		
	Unit #3	**String Security and Stack Buffer Overflow**	**25**	**64.28**
12	**String Security and Stack Buffer**	Strings: Common String Manipulation Errors,		
13		String Vulnerabilities- Program Stacks,		

14	**Overflow** **T1: Chapter 4: Buffer Overflow Attack** **T2: Characters and Strings**	Buffer Overflow attack- Program memory layout,		
15		Stack and Function Invocation,		
16		Stack Buffer Overflow Attack,		
17		Address Randomization,		
18		StackGuard		
	Unit #4 **Format String Vulnerability** **T1: Chapter 6: Format String Vulnerability**	**Format String Vulnerability**	**17.86**	**82.13**
19		Format String Vulnerability- Functions with variable number of arguments,		
20		Format string with Missing optional Arguments		
21		Vulnerable program and Experiment Set up		
22		Exploiting format string Vulnerability-Attack 1, 2,3		
23		Exploiting format string Vulnerability-Attack 4,5, Countermeasures		
	Unit #5 **Return to libc and Race Condition Vulnerability** **T1: Chapter 5: Return to Libc Attack** **Chapter 7 : Race condition Vulnerability**	**Return to libc and Race Condition Vulnerability**	**17.86**	**100**
24		Arc Injection: Return-to-libc Attack		
25		Attack Experiment Setup,Launch attack		
26		Race Condition Vulnerability- Race condition problem,		
27		Vulnerability and		
28		Countermeasures		

Literature

Book Type	Code	Title & Author	Publication Information		
			Edition	Publisher	Year
Text Book	T1	Computer Security A Hands-on Approach, - Wenliang Du	1	CreateSpace	2017
	T2	SEI CERT- C Coding Standard Rules for Developing Safe, Reliable and Secure Systems	1	SEI-CMU	2016

UE18CS275X – WEB FRAMEWORKS (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 Introduction**	What are frameworks? Frameworks vs Libraries	**17.85**	**17.85**
2		Classification of Frameworks, Selecting Frameworks,		
3		Client-Server Architecture, HTTP,		
4		MVC Pattern		
5		MVC Pattern		
6	**Unit#2**	Django – Introduction & Installation	**21.42**	**39.27**
7	**Django - I**	Django Models		
8		Django Admin		
9		Django URLs		
10		Django Views		
11		Django Views		
12		Django ORM	**21.42**	**60.69**
13		Dynamic Data in Templates		

14		Django Templates		
15		Extending Templates		
16		Django Forms		
17		Django Forms		
18	**Unit#4**	Introduction, Building a React App	**21.42**	**82.11**
19	**React.js**	Components		
20		State		
21		Accessing DOM Elements		
22		Events		
23		Redux		
24	**Unit #5**	Interaction between frameworks	**17.89**	**100**
25	**Misc. frameworks**	Connecting React & Django		
26		Connecting React & Django		
27		Adopting a Framework with ease (Self-learning Assignment)		
28		Adopting a Framework with ease (Self-learning Assignment)		

Literature

Book Type	Code	Title & Author	Publication Information		
			Edition	Publisher	Year
Text Book	T1	Django Girls	1	Online Tutorial @ https://tutorial.djangogirls.org/en/	
Text Book	T2	Learning React, Kirupa Chinnathambi	1	Online Tutorial @ https://www.kirupa.com/react/	

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UE18CS208A - OPERATION LINUX/UNIX : *nix (2-0-0-0-2)

(Start your own internet company with *nix)

Class #	Chapter Title / Reference Titles	Topics to be Covered	Coverage	Cumulative %
Unit 1 Introduction to UNIX : Textbook 1: Chapters 2,4,5,6, 9				
1	Introduction to UNIX	Salient Features, Layered Architecture, Concept of Shell and Kernel, File System, Concept of Process	**20%**	**20%**
2	File System Related Commands	Creating and Removing Directories and Files, View the Content of a File, Copying/Moving Files, Hard Links/ Symbolic Links, Inode Structure, View the content of the directory		
3	Different Types of Files	Regular Files, Directories, Character and Block Device Files, Named Pipes		
4		Socket Files, File Permissions - Effective User ID, Sticky Bit.		
5	Modifying File Permissions	Effect of File Permissions on Different Commands of UNIX.		
6	Time Stamp	Access Time, Modification Time and Change Time, Effect of Different Commands on These Times.		
7	Process	Process Related Commands		
8		Concept of Process, Process Status, Child and Parent Process, Process ID		
9		Orphan and Zombie, Background and Foreground Processes, Executing process at a particular time		
Unit 2 Shell and Scripting T1:Chapters 8,12,13.1-13.3, 14				
12	Shell, Filters and Shell Scripting	Meta Characters, Redirection and Piping, Filters – sort, uniq, grep, wc, tail and head, Variables.	**30%**	**50%**
13		Input/ Output and Assignment, Quoting – Single Quotes, Double Quotes and Back Quotes, Shell Scripts – Executing Shell Programs in Different Ways,		
14		Environment Variables – Export Command, Relational and Logical Operators – Test Command		
15		Selection – if and case Commands		
16		Looping – while, until and for Loops.		

17		Command Line Arguments and Shift Command		
18		Arithmetic in Shell Programs		
19		Calling Another Shell Program Within Another shell program, Recursion, User defined functions		
Unit 3 *nix operations V				
23	Linux	Install Ubuntu Linux, learn different installs, basic commands, install packages	**30%**	**80%**
24	Firewalls	Types of firewall, install and configure Ubuntu Firewalls		
25	Load balancers	Types of Load balancers, install and configure open source load balancers		
26	Webservers	Types of webservers, install and configure Apache webservers. Learn to install certificates and run an https web servers		
27	Application Servers	Types of application servers, install and configure Django and foreword to develop apps		
28	Database Servers	Types of database servers, install and configure mysqli. Learn to make database calls from the app server and webserver		
29	Intrusion Detection	Types of intrusion detection servers (IDS), install and configure open source IDS		
Unit 4: Trouble Shooting *nix V				
30	Trouble shooting Techniques	Learn different commands, tcpdump, traceroute, basic booting of a server. Learn top 10 trouble shooting techniques and commands with *nix	**10%**	**90%**
Unit 5: Setting up your own internet company V				
31	Setting up your own internet company	Internet applications - Basics of an internet application and working, learn to install webserver with app server and database server. Learn to run and track app with packets traversing across all the different tiers. Web Hosting services, choosing a technology service provider, performance metrics. Basics of Finance and misc basic Legal Matters	**10%**	**100%**

Literature

Book Type	**Code**	**Title & Author**	**Publication Information**		
			Edition	**Publisher**	**Year**
Text Book	T	UNIX Concepts and Applications, Sumitabha Das	4	McGraw Hill Education	2012
Reference	R1	Classic Shell Scripting, Arnold Robbins and Nelson H. F. Beebe	1	O'Reilly Media;	2005

Book					
Videos	V1	Links will be shared in the class through an LMS (learning management system) Platform		YouTube and other	