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.

V SEMESTER (2019-23 BATCH)

Sl. No.	Course Code	Course Title	Hours per week				Credits	Tools / Languages	Course Type
			L	T	P	S	C		
1	UE19CS301	Database Management System	4	0	0	4	4	Postgre SQL 13.3, ERwin	CC
2	UE19CS302	Software Engineering	4	0	0	4	4	GitHub, MS Project, Jenkins	CC
3	UE19CS303	Machine Intelligence*	4	0	0	4	4	Tensorflow 1.15, Keras 2.3.1, Python 3.7	CC
4	UE19CS304	Database Management System Laboratory	0	0	2	1	1	Oracle, MySQL,SQL Server, PostgreSQL	CC
5	UE19CS305	Machine Intelligence Laboratory	0	0	2	1	1	Python(3.7x), sklearn(v0.23), Keras(v2.2.4), Tensorflow(v1.14)	CC
6	UE19CS31X	Elective I	4	0	0	4	4		EC
7	UE19CS32X	Elective II	4	0	0	4	4		EC
8	UE19CS306X	Special Topic- III	2/4/4			2	2		ST
Total			**20/22**	**0**	**4/8**	**24**	**24**		
Elective – I									
9	UE19CS311	Advanced Algorithms%	4	0	0	4	4	C or C++	EC
10	UE19CS312	Data Analytics&	4	0	0	4	4	Python and R	EC
11	UE19CS313	Internet of Things	4	0	0	4	4	Python or C	EC
12	UE19CS314	Applied Cryptography	4	0	0	4	4	Seed virtual machine environment, gcc, python	EC
13	UE19CS315	Fundamentals of Augmented and Virtual Reality!!!	4	0	0	4	4	C, C++, Java, Python using OpenGL	EC
14	UE19CS316	Human Computer Interaction	4	0	0	4	4	C/C++/JAVA/ Python using OpenGL.	EC

Elective – II									
15	UE19CS321	Principles of Programming Languages	4	0	0	4	4	Various compilers and Debuggers as GCC, g++, Ada, Python, Ruby, Java, Prolog, Haskell, GDB, PDB.	EC
16	UE19CS322	Big Data$	4	0	0	4	4	Hadoop, HDFS Spark, Streaming spark, HIVE, Hbase, Mllib	EC
17	UE19CS323	Graph Theory, Applications and Combinatorics!	4	0	0	4	4	C-Language	EC
18	UE19CS324	Bio-inspired Computing%	4	0	0	4	4	Matlab	EC
19	UE19CS325	Advance Computer Networks%%	4	0	0	4	4	Claynet, Cisco Packet Tracer	EC
20	UE19CS326	Computer Network Security%%	4	0	0	4	4	Seed Ubuntu VM, Wireshark, Snort, NetwoX, Scapy	EC

Note: Desirable Knowledge - Core : *- UE19CS203, UE19MA251, UE19CS251.

Desirable Knowledge – Elective I : %- UE19CS251, &- UE19CS203, !!!- UE19CS202.

Desirable Knowledge – Elective II : $-UE19CS202, UE19CS251, !- UE19CS151, UE19CS202, %- UE19CS251, %%- UE19CS253.

ELECTIVES TO BE OPTED FOR SPECIALIZATION

Sl. No.	SPECIALIZATION	ELECTIVE – I	ELECTIVE – II
A	System and Core Computing(SCC)	UE19CS311, UE19CS315.	UE19CS321, UE19CS322, UE19CS323.
B	Machine Intelligence and Data Science(MIDS)	UE19CS312, UE19CS313, UE19CS315, UE19CS316.	UE19CS322, UE19CS323, UE19CS324.
C	Network and Cyber Security(NWCS)	UE19CS313, UE19CS314.	UE19CS325, UE19CS326.

UE19CS301 – DATABASE MANAGEMENT SYSTEMS (4:0:0:0:4)

Total # of Credits: 4 **No. f hours: 56**

Class #	Reference Literature	Topics	% of Portion covered	
			% of Syllabus	Cumulative %
Unit #1 - Introduction to Database and Conceptual Design using ERD			**18**	**18**
1	**T1: 1.1 – 1.8**	Introduction to Databases		
2				
3	**T1: 2.1 –2.3**	Data models, Three-Schema Architecture and Data Independence, Database Languages and Interfaces		
4	**T1: 2.4 – 2.6**	Database system environment, Centralized and Client/Server architectures, Classification of database management system		
5	**T1: 3.1 – 3.3**	Conceptual Model, Entity types, attributes and keys		
6	**T1: 3.4**	Relationship types, sets, roles		
7	**T1: 3.5 – 3.7**	Weak Entity, Refining the ER design, ER diagrams		
8				
9	**T1: 3.9**	Relationship Types of degree higher than two		
10	**T1: 3.10**	Example: University database		
Unit #2 - Relational Model			**18**	**36**
11	**T1: 5.1**	Relational Model concepts		
12	**T1: 5.2**	Relational model Constraints and relational Database Schemas		
13	**T1: 5.3**	Update operations, Transactions and dealing with constraint violations		
14	**T1: 9.1**	Relational Database Design Using ER-to Relational Mapping		
15	**T1: 8.1**	Unary Relational Operations		
16	**T1: 8.2**	Set Theory Operations		
17	**T1: 8.3**	Binary Relational Operations - JOIN, DIVISION		
18	**T1: 8.4**	Aggregate Functions and Grouping		
19				
20	**T1: 8.5**	Examples of Queries in Relational Algebra		
Unit #3 – SQL			**21**	**57**
21	**T1: 6.1**	Advanced Data Types like CLOB, BLOB		
22	**T1: 6.2 – 6.5** **R1: Ch 4**	Advanced SQL Queries, Other SQL Constructs : WITH, CASE, Outer joins,		
23		Sub- queries, Correlated sub-queries, ANY, ALL, ROLLUP,		
24				
25		CUBE, PIVOT,		

26		Query execution plan		
27		Practice examples		
28	**T1: 7.1 – 7.4**	Specifying General Constraints as Assertions and Triggers, Viewsand Schema Change Statements in SQL		
29				
30	**T1: 10.1 – 10.5**	Database Programming - functions, stored procedures, cursors		
31				
32				
Unit#4 - Database Design				
33	**T1: 14.1**	Informal Design Guidelines for Schemas	**21**	**78**
34	**T1: 14.2**	Functional Dependencies		
35	**T1: 15.1**	Inference Rules, Closure		
36	**T1: 15.1.2 – 15.1.3**	Equivalence, Minimal Cover		
37	**T1: 15.2**	Properties of Relational Decompositions		
38	**T1: 14.3**	Normal Forms Based on Primary Keys (1st, 2nd and 3rd NF), General Definitions of Second and Third Normal Forms		
39	**T1: 14.4**			
40	**T1: 14.5 – 14.7**	Boyce-Codd Normal Form, Overview of Higher Normal Forms		
41				
42	**T1: 15.3**	Algorithms for Relational Database Schema Design		
43	**T1: 15.4**	About Nulls, Dangling Tuples, and Alternative Relational Designs		
44		Additional Examples		
Unit #5 - Implementation of Database Systems				
45	**T1: 30.1 – 30.3**	Database Security (CREATE USER, ROLE,GRANT and REVOKE)	**22**	**100**
46	**T1: 20.1, 20.3-20.5**	Transactions - ACID Properties, schedules		
47	**T1: 20.6**	SQL commands for database transactions (BEGIN, END, COMMIT, SAVEPOINT, ROLLBACK)		
48	**T1: 21.1, 21.2**	Concurrency, Locking, Deadlocks - Detection and Prevention		
49				
50	**T1: 19.9** **T1: 17.1, 17.6–17.7**	Additional Features of SQL – performance, execution plan Optimization - indexed approach to show the speed up.		
51	**T1: 24.1**	NoSQL databases		
52	**T1: 24.3**	Document databases		
53	**T1: 24.4**	Key-value databases		
54	**T1: 24.5**	Column Oriented Databases		
55	**T1: 24.6**	Graph databases		
56	**R1: 19.2**	In-memory databases		

Literature

Book Type	Code	Title & Author	Publication Information		
			Edition	Publisher	Year
Text Book	T1	Fundamentals of Database Systems - RamezElamsri, Shamkant B Navathe	7th	Pearson	2017
Reference Book	R1	Database System Concepts -Silberschatz, H Korth, S Sudarshan	7th	McGraw-Hill	2019

UE19CS302: Software Engineering (4:0:0:0:4)

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

Class #	Chapter Title / Reference Literature	Topics to be Covered	% Of Portion Covered	
			Absolute	Cumulative
Unit 1: Introduction to Software Engineering& Requirements Engineering			21	21
1	**12 Hours T1: Ch 1,9,10 and Internet sources**	Overview, Context and Drivers of Software Engineering,Process Phases and drifting into lifecycles		
2		Generic phases of lifecycle – SDLC, PLC, Support LC		
3		Legacy Models: Waterfall Model, V, Prototype, Incremental, Evolutionary Models		
4		Characteristics of Legacy/Plan driven Models, Agile Manifesto, Exposure to different approaches of Agile SCRUM, XP and Lean Agile		
5		Scrum, How SCRUM addresses limitations of Plan driven models		
6		Case Study/Exercise		
7		Reuse focused Software Development approaches - CBSE, Product Line		
8		Software Requirements, Requirement properties, Feasibility study, Requirements Eng. Process		
9		Requirements Elicitation, Requirement Analysis - Intro to UML		
10		Use case models, Requirement Analysis		
11		RequirementsSpecification, Validation & RTM		
12		Case Study/Exercise		
Unit 2: Software Project Management, Architecture and Design			21	43
13	**12 Hours T1: Ch 2,7,8,11,12 and Internet Sources**	Software Project Management Fundamentals, Lifecycle		
14		Project Planning - 1		
15		Project Planning – 2 (including estimation, Tool)		
16		Project Monitoring & Control, Closure		
17		Case Study/Exercise		
18		Software Architecture: Intro, Characteristics and Influencing factors, Architecture block diagrams, big-picture of Architectural views, styles, patterns		
19		Architectural choices and impacts, architecture conflicts, generalized models and common approaches towards architecture - decomposition		

20		Architectural Views, Styles, Architectural patterns		
21		Software Design: Introduction,enabling techniques and key issues to be handled in design, Contrasting Architecture and Design		
22		Design method -illustration, Design Patterns		
23		Contrast with Object Oriented Architecture and Design		
24		SoA		
Unit 3: Implementation, SCM, Software Quality & Relationship to Testing:			18	61
25	**10 Hours T1: Ch 3& References and Internet Sources**	Introduction, Construction languages, DE, Bug and its journey, cost of a bug, generic implementation thoughts and code personalities		
26		Characteristics of code, Coding standards and Coding guidelines, Factors for effective coding, Defensive and Secure coding, testable coding		
27		Managing construction, Code review, Inspection, Unit testing, RTM		
28		Case Study/Exercise		
29		Introduction to configuration management and configuration management activities and Basic configuration management activities and structures of SCM		
30		Configuration Management Activities: Branch, Version, Build and Install Management, Promotion Management		
31		Configuration Management Activities: Change, Defect/Bug management and Release Management		
32		Configuration management planning and tools		
33		Software Quality, A Taxonomy of Quality Attributes, Perspectives on Quality, Cost of Quality		
34		Metrics, Software Quality Assurance, SEI CMM, Testing and Quality/Reliability		
Unit 4: Software Testing and Maintenance				
35	**12 Hours T1: Ch 13, Ch 14**	Introduction to testing, Test Objectives, Verification and Validation, terminologies and characterizing testing	21	82
36		Testing types – 1 (Types and Levels)		
37		Testing types – 2 (Types and Levels)		
38		Testing types – 3 (Types and Levels)		
39		Test Planning - 1 Adequacy, Models, Strategy		
40		Test planning – 2 Schedule, resource, milestones, risks and measures and a test plan		

41		Testing Process/lifecycle, measures and roles & responsibilities, Test Cases		
42		Test cases, Test case generation, Examples		
43		Test execution and Metrics		
44		Exposure to tools like Junit/Selenium – Case Study/Exercise		
45		Software Maintenance Introduction and lifecycle		
46		Software Maintenance techniques and approaches		
Unit 5: Ethics, SE in Global Environment, ITSM, ITIL and DevOps				
47	**10 Hours T1: Ch 6**	Software Engineering in a Global Environment, Software Engineering and Hacking	18	100
48		Ethics in a Software		
49		Software Development to Software Services and Operations		
50		ITSM and ITSM processes		
51		ITIL and the Service Lifecycles		
52		DevOps: Introduction and terminologies		
53		DevOps Pipeline - 1		
54		DevOps Pipeline - 2		
55		DevOps – Pillars of DevOps		
56		Exploration of a tool like Jenkins		

Literature:

Book Type	Code	Title and Author	Publication info		
			Edition	Publisher	Year
Text Book	T1	Software Engineering: Principles and Practice, Hans van Vliet	3rd	Wiley India	2010
Text Book	T2	Software Testing – Principles and Practices", Srinivasan Desikan and Gopalaswamy Ramesh		Pearson	2006
Reference Book	R1	"Effective DevOps: Building a Culture of Collaboration, Affinity, and Tooling" by Jennifer Davis, Ryn Daniels	1st	O'Reilly	2016
Reference Book	R2	Software Engineering (A practitioner's approach), Roger S Pressman	6th	McGraw Hill	2005
Reference Book	R3	Software Engineering, Ian Somerville	9th	Pearson Education	2009
Reference Book	R4	Foundations of Software Testing, Aditya Mathur	2nd	Pearson Education	2013
Reference Book	R5	Software Testing, A Craftsman's Approach, Paul C. Jorgensen	4th	Auerbach Publications	2013
Contents from Other Sources	R6	Various Articles, Papers and Contents from Internet, IEEE SWEBOK			

Computer Science And Engineering
(Aug – Dec, 2021)

UE19CS303: Machine Intelligence

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

Class #	Chapter Title / Reference Literature	Topics to be Covered	% Of Portion Covered	
			Absolute	Cumulative
Unit 1			21.4	21.4
1	T1 : Chapter 1 - 1.1	Introduction to AI and ML		
2	T1 : Chapter 2 - 2.1, 2.3, 2.4,2.5	Intelligent Agents and its Types		
3	Link	Machine Learning and its Models		
4	T1 : Chapter 3 - 3.1,3.2,3.3,3.4	Problem solving by Searching- Uninformed Search		
5	T1 : Chapter 3 - 3.5,3.6,3.7	Problem solving by Searching- Informed Search		
6	Design learning system	Perspectives and Issues, designing learning systems		
7	T2: Chapter2 - 2.1-2.4,2.7	Concepts of hypotheses, Version space, inductive bias		
8	Link	Performance metrics-accuracy, precision, recall, sensitivity, specificity, AUC, RoC		
9	T2: Ch 3 3.1, 3.2, 3,3	Decision Trees- Basic algorithm (ID3)		
10	T2: Ch 3 3.4, 3.5, 3.6	Hypothesis search and Inductive bias, Entropy and Gain calculations		
11	T2: Ch 3 3.7	Issues in Decision Tree Learning – Overfitting and Solutions to overfitting, Dealing with continuous values		
12	T2: Ch 3, Slides	Solving a numerical problem on Decision Trees		
Unit 2:			17.85	39.25
13	T2: Ch 8 pg230-236	Instance-based learning: k-nearest neighbor learning		
14		Simple problems – weighted KNN Issues with KNN – discussion		
15	T2: Ch 4 pg 81-85	Artificial Neural networks: Introduction		
16	T2: Ch 4 pg 86-94	Perceptrons – implementing LOGIC gates		
17	T2 Ch 4 pg95-101	Multi-layer networks and back-propagation		
18		Back-propagation derivation		
19	Slides	Activation Units – discussion		
20	T4 Ch3 pg38-53	Support Vector Machines – margin and maximization and the primal form		
21	T4 Ch4 pg54-59	SVM - The Lagrangian dual and its solution		

22	T4 C6 pg72-81	SVM – Kernel Trick Simple problems on SVM		
Unit 3:				
23	R4: Pages 129-131	Improving performance: Bagging and Boosting		
24	R4: Pages 131-133	Adaboost - combining weak learners		
25	T2: Ch6 – Pages 154-166, 170-171, 174-176	Bayesian Learning – Bayes theorem, Concept learning Maximum likelihood, MAP, Bayes optimal classifier		
26	T2: Ch6 – Pages 177-183	Naïve Bayes classifier and text classification.		
27	R3: Ch15 - Pages 363-366	Hidden Markov models – discrete Markov processes	21.4	60.65
28	R3: Ch15 - Pages 367-373	Hidden Markov models – 3 basic problems		
29	R3: Ch15 - Pages 373-375	Learning the state sequence		
30	R3: Ch15 - Pages 375-378	Learning the parameters, Baum-Welch Algorithm		
31	Slides	Simple problems in Hidden Markov Models		
Unit 4:				
32	R5: Chapter 9, Pg 286-289	Expectation Maximization Algorithm		
33		Expectation Maximization Algorithm		
34	R5: Chapter 9, Pg 289-292	Gaussian Mixture Models		
35	R4: Ch10: Pages 207-217,Ch11: Pages 224-234, Ch12:Pages 248-260	Unsupervised Learning: Hierarchical vs non-hierarchical clustering, Agglomerative and divisive clustering		
36	R1: Chapter 9, Pg 424-430 R1: Chapter 9, Pg 439	K-means clustering, Simple problems Bisecting k-means, issues with k-means. K Means as special case of Expectation Maximization	17.85	78.5
37	R1: Chapter 12, Pg 559-570	Dimensionality reduction techniques PCA		
38	Slides	SVD – Applications.		
39	T2: Ch9 - 9.1, 9.2	Genetic Algorithms – Representing hypothesis, Genetic operators		
40	T2: Ch9 - 9.2, 9.3	Fitness function and selection methods, crossover, mutation		
41	T2: Ch 9	Simple applications of the Genetic Algorithm, application of GA in Decision tree Genetic Algorithm based clustering		

42	T2: Ch7.1-7.4,Ch9	Single Objective optimization problems using GA Using GA to emulate Gradient descent/ascent		
43	T2: Ch9, Slides	Introduction to PSO		
44	T2: Ch9, Slides	Application in Single Objective optimization problems		
Unit 5:				
45	T2: Ch 4 pg 81-85	Modelling the Neural Network (T1- pg No 725-778,839-871) Loss Function/Error Function(T1- pg No 911-939)	21.4	100
46		Forward propagation(T2- pg 59-62) Backward propagation(T2 -pg 63-70)		
47	Link 1 Link 2 Link 3	Bias and Variance Trade off Regularization Batch Normalization		
48	NPTEL NOTES	Optimizers		
49	NPTEL NOTES	Sequence Learning Probelms		
50	NPTEL NOTES	Designing Simple RNN Cell and Understanding its Dimensions		
51	T3: Chapter 4 pg number 218-234 (detailed derivation not included)	Training RNN ,backpropagation		
52	T3: Chapter 4 pg number 236-240,261-266	Various architectures of RNN , Concept of vansihing and exploiding gradients		
53	T3: Chapter 5 (basic intro to LSTM and GRU)	Concept of Selctive Read ,Write and Forget Understanding LSTM and GRU Genrating Song Lyrics using RNN (Handson)		
54	Mitesh Khapra slides on CNN & T3: Ch 6 (Demystifying Convolutional Networks)	Architecture of CNNs, filters and feature maps(T3-chapter6)		
55		Pooling layers, types, paddings, fully connectedLayers(T3- chapter6)		
56	Hands on video	Case study – Image classification using Keras(class work)		

Literature:

Book Type	Code	Title and Author	Publication info		
			Edition	Publisher	Author
Text Book	T1	1. Artificial Intelligence: A Modern Approach (3rd Edition), Stuart Russel and Peter Norvig,	3rd	Wiley India	Stuart Russel and Peter Norvig,
Text Book	T2	Machine Learning, Tom Mitchell, McGraw Hill Education (India), 2013.		McGraw Hill Education (India)	Tom Mitchell
Text Book	T3	Hands-on Deep Learning Algorithm with Python - Sudharshan Ravi Chandiran			Sudharshan Ravi Chandiran
Text Book	T2	Support Vector Machines Succinctly by Alexandre Kowalczyk			Alexandre Kowalczyk
Reference Book	R1	"Pattern Recognition and Machine Learning", Christopher Bishop, Springer (2nd Printing), 2011		Springer (2nd Printing), 2011	Christopher Bishop
	R3	Introduction to Machine Learning Second Edition by Ethem Alpaydin	2nd		Ethem Alpaydin
	R4	Machine Learning in Action by Peter Harrington, First Edition, Manning 2021	1st	Manning (2021)	Peter Harrington
	R5	"Machine Learning: The Art and Science of Algorithms that Make Sense of Data", Peter Flach, Cambridge University Press (2012).		Cambridge University Press (2012)	Peter Flach