ACADEMIC CURRICULA

UNDERGRADUATE DEGREE PROGRAMMES

Bachelor's Degree in Technology

(B.Tech - Four Years)

(Choice Based Flexible Credit System)

Regulations 2018

(Detailed Syllabus for Computer Science & Business Systems)

SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

(Deemed to be University u/s 3 of UGC Act, 1956)

Kattankulathur, Kancheepuram 603203, Tamil Nadu, India

20. B.Tech. in Computer Science and Business Systems

(In Collaboration with TCS)- 2020 Onwards)

20. (a) Mission of the Department

Mission Stmt - 1	*To impart knowledge in cutting edge Computer Science and Engineering technologies in par with industrial standards.*
Mission Stmt - 2	*To collaborate with renowned academic institutions to uplift innovative research and development in Computer Science and Engineering and its allied fields to serve the needs of society*
Mission Stmt - 3	*To demonstrate strong communication skills and possess the ability to design computing systems individually as well as part of a multidisciplinary teams.*
Mission Stmt - 4	*To instill societal, safety, cultural, environmental, and ethical responsibilities in all professional activities*
Mission Stmt - 5	*To produce successful Computer Science and Engineering graduates with personal and professional responsibilities and commitment to lifelong learning*

20. (b) Program Educational Objectives (PEO)

PEO - 1	*Graduates will be able to perform in technical/managerial roles by thorough understanding of contemporary technologies*
PEO - 2	*Graduates will be able to successfully pursue higher education in reputed institutions where information technology businesses are a priority*
PEO - 3	*Graduates will be able to apply technology abstraction and common business principles*
PEO - 4	*Graduates will be able to demonstrate innovation abilities.*
PEO - 5	*Graduates will be able to demonstrate ethics and responsibility and have accumulated life values*

20. (c) Mission of the Department to Program Educational Objectives (PEO) Mapping

	Mission Stmt. - 1	Mission Stmt. - 2	Mission Stmt. - 3	Mission Stmt. - 4	Mission Stmt. - 5
PEO - 1	*H*	*H*	*H*	*H*	*H*
PEO - 2	*L*	*H*	*H*	*H*	*H*
PEO - 3	*H*	*H*	*M*	*L*	*H*
PEO - 4	*M*	*H*	*M*	*H*	*H*
PEO - 5	*H*	*H*	*M*	*M*	*H*

H – High Correlation, M – Medium Correlation, L – Low Correlation

20. (d) Mapping Program Educational Objectives (PEO) to Program Learning Outcomes (PLO)

	Program Learning Outcomes (PLO)														
	Graduate Attributes (GA)												Program Specific Outcomes (PSO)		
	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO - 3
PEO - 1	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*
PEO - 2	*H*	*H*	*H*	*H*	*H*	*L*	*L*	*H*	*L*	*H*	*L*	*H*	*H*	*H*	*H*
PEO - 3	*H*	*H*	*H*	*H*	*H*	*L*	*L*	*L*	*L*	*L*	*H*	*H*	*H*	*H*	*H*
PEO - 4	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*
PEO - 5	*H*	*H*	*H*	*H*	*H*	*M*	*M*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*

H – High Correlation, M – Medium Correlation, L – Low Correlation

PSO – Program Specific Outcomes (PSO)

PSO - 1	*Ability to understand client requirements and suggest solutions*
PSO - 2	*Ability to create innovative Software for business and service orientations*
PSO - 3	*Ability to utilize Logic & Reasoning Skills*

20. (e) Program Structure: B.Tech. in Computer Science and Business Systems

	1. Humanities & Social Sciences including Management Courses (H)				
Course Code	Course Title	Hours/ Week L	T	P	C
18MBH161T	Business Communication & Value Science - I	2	0	0	2
18MBH162T	Business Communication & Value Science - II	2	0	0	2
18MBH163T	Fundamentals of Economics	2	0	0	2
18MBH261T	Introduction to Innovation, IP Management and Entrepreneurship	3	0	0	3
18MBH262J	Design Thinking	2	0	2	3
18MBH361T	Business Communication & Value Science – III	2	0	0	2
18MBH362T	Business Communication & Value Science - IV	2	0	0	2
18MBH363T	Fundamentals of Management	2	0	0	2
18MBH364T	Business Strategy	2	0	0	2
18MBH365T	Financial and Cost Accounting	2	0	0	2
18MBH461T	Financial Management	2	0	0	2
18MBH462T	Human Resource Management	2	0	0	2
18MBH463J	Services Science and Service Operational Management	3	0	2	4
18MBH464J	IT Project Management	3	0	2	4
18MBH465T	Marketing Research and Marketing Management	2	0	0	2
	Total Learning Credits				**36**

	2. Basic Science Courses (B)				
Course Code	Course Title	Hours/ Week L	T	P	C
18PYB161J	Fundamentals of Physics	2	0	2	3
18MAB165T	Discrete Mathematics	3	1	0	4
18MAB166T	Probability and Statistics	3	0	0	3
18MAB163T	Linear Algebra	3	1	0	4
18MAB167J	Statistical Modeling	3	0	2	4
18MAB261J	Operations Research	2	0	2	3
	Total Learning Credits				**21**

	3. Engineering Science Courses (S)				
Course Code	Course Title	Hours/ Week L	T	P	C
18EES161J	Principles of Electrical Engineering	2	0	2	3
18EES162J	Principles of Electronics	2	0	2	3
	Total Learning Credits				**6**

	4. Professional Core Courses (C)				
Course Code	Course Title	Hours/ Week L	T	P	C
18CSC161J	Fundamentals of Computer Science	3	0	4	5
18CSC162J	Data Structures and Algorithms	3	0	4	5
18CSC261T	Formal Language and Automata Theory	3	0	0	3
18CSC262J	Computer Organization and Architecture	3	0	2	4
18CSC263J	Object Oriented Programming	2	0	4	4
18CSC264J	Computational Statistics	3	0	2	4
18CSC265J	Software Engineering	3	0	2	4
18CSC266J	Operating Systems	3	0	2	4
18CSC267J	Database Management Systems	3	0	2	4
18CSC268J	Software Design with UML	2	0	2	3
18CSC361J	Design and Analysis of Algorithms	3	0	2	4
18CSC362J	Compiler Design	3	0	2	4
18CSC363J	Computer Networks	3	0	2	4
18CSC364J	Information Security	3	0	2	4
18CSC365J	Artificial Intelligence	3	0	2	4
18CSC461J	Usability Design of Software Applications	2	0	2	3
18CSC462J	IT Workshop using Scilab	1	0	2	2
	Total Learning Credits				**65**

	5. Professional Elective Courses (E) (Any 5 Elective Courses)				
Course Code	Course Title	Hours/ Week L	T	P	C
	Professional Elective - 1				
18CSE361J	Conversational Systems	2	0	2	3
18CSE362J	Cloud, Microservices& Application	2	0	2	3
18CSE363J	Machine Learning	2	0	2	3
	Professional Elective - 2				
18CSE364J	Robotics and Embedded Systems	2	0	2	3
18CSE365J	Modern Web Applications	2	0	2	3
18CSE366J	Data Mining and Analytics	2	0	2	3
	Professional Elective - 3				
18CSE467J	Enterprise Systems	2	0	2	3
18CSE468J	Advance Finance	2	0	2	3
18CSE469J	Image Processing and Pattern Recognition	2	0	2	3
	Professional Elective - 4				
18CSE461J	Cognitive Science & Analytics	2	0	2	3
18CSE462J	Introduction to IoT	2	0	2	3
18CSE463J	Cryptology	2	0	2	3
	Professional Elective - 5				
18CSE464J	Quantum Computation & Quantum Information	2	0	2	3
18CSE465J	Advanced Social, Text and Media Analytics	2	0	2	3
18CSE466J	Mobile Computing	2	0	2	3
	Total Learning Credits				**15**

	Open Elective Courses (O) (Any 1 Courses))				
Course Code	Course Title	Hours/ Week L	T	P	C
18CSO161T	Behavioral Economics	2	1	0	3
18CSO162T	Computational Finance & Modeling	2	1	0	3
18CSO163T	Psychology	2	1	0	3
	Total Learning Credits				**3**

Note: Students of B. Tech CSBS should choose their open electives only from the list given in this curriculum.

	7. Project Work, Seminar, Internship In Industry/ Higher Technical Institutions (P)				
Course Code	Course Title	Hours/ Week L	T	P	C
18CSP361L	Mini Project - 1	0	0	2	1
18CSP461L	Project Evaluation - 1	0	0	6	3
18CSP462L	Project Evaluation - 2	0	0	20	10
	Total Learning Credits				**14**

	8. Mandatory Courses (M)				
Code	Course Title	L	T	P	C
18PDM101L	Professional Skills and Practices	0	0	2	0
18PDM201L	Competencies in Social Skills	0	0	2	0
18PDM202L	Critical and Creative Thinking Skills	0	0	2	0
18PDM301L	Analytical and Logical Thinking Skills	0	0	2	0
18LEM101T	Constitution of India	1	0	0	0
18LEM102J	Value Education	1	0	1	0
18LEM10XJ	Chinese / French / German / Japanese/ Korean	2	0	2	0

	8. Mandatory Courses (M)				
Code	Course Title	L	T	P	C
18GNM101L	Physical and Mental Health using Yoga	0	0	2	0
18GNM102L	NSS	0	0	2	0
18GNM103L	NCC				
18GNM104L	NSO				
18LEM109T	Indian Traditional Knowledge	1	0	0	0
18LEM110L	Indian Art Form	0	0	2	0
18CYM101T	Environmental Science	1	0	0	0
18CSM261L	Competitive Professional Skills-I	0	0	2	0
18CSM361L	Competitive Professional Skills-II	0	0	2	0
18CSM362L	Competitive Professional Skills-III	0	0	2	0

20. (f) Program Articulation: B.Tech. in Computer Science and Business Systems

		Program Learning Outcomes (PLO)														
		Graduate Attributes												PSO		
Course Code	Course Name	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO - 3
18PYB161J	*Fundamentals of Physics*	*H*	*H*	*H*	*H*	*H*	*M*	*L*	*M*	*H*	*M*	*M*	*H*	*H*	*H*	*M*
18MAB165T	*Discrete Mathematics*	*H*	*H*	*H*	*H*	*M*	*L*	*L*	*L*	*M*	*M*	*L*	*H*	*H*	*H*	*H*
18MAB166T	*Probability and Statistics*	*H*	*H*	*H*	*H*	*M*	*M*	*L*	*L*	*M*	*M*	*L*	*H*	*H*	*H*	*H*
18MAB163T	*Linear Algebra*	*M*	*H*	*M*	*H*	*M*	*M*	*L*	*M*	*M*	*M*	*M*	*H*	*L*	*H*	*H*
18MAB167J	*Statistical Modeling*	*M*	*H*	*H*	*H*	*H*	*M*	*L*	*M*	*M*	*M*	*M*	*H*	*L*	*H*	*H*
18MAB261J	*Operations Research*	*H*	*H*	*H*	*M*	*H*	*M*	*L*	*M*	*H*	*M*	*M*	*H*	*L*	*H*	*H*
18EES161J	*Principles of Electrical Engineering*	*H*	*H*	*H*	*H*	*H*	*L*	*L*	*M*	*H*	*H*	*L*	*H*	*H*	*H*	*H*
18EES162J	*Principles of Electronics*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*
18MBH161T	*Business Communication & Value Science – I*	*H*	*H*	*M*	*M*	*H*	*L*	*L*	*M*	*H*	*M*	*L*	*H*	*L*	*H*	*H*
18MBH162T	*Business Communication & Value Science – II*	*H*	*H*	*H*	*H*	*M*	*L*	*L*	*M*	*H*	*M*	*M*	*H*	*L*	*H*	*H*
18MBH163T	*Fundamentals of Economics*	*H*	*H*	*H*	*H*	*H*	*M*	*L*	*M*	*H*	*H*	*M*	*H*	*L*	*H*	*H*
18MBH261T	*Introduction to Innovation, IP Management and Entrepreneurship*	*H*	*M*	*H*	*M*	*L*	*L*	*L*	*M*	*L*	*L*	*L*	*M*	*H*	*M*	*M*
18MBH262J	*Design Thinking*	*H*	*H*	*H*	*H*	*M*	*M*	*L*	*M*	*M*	*M*	*M*	*H*	*L*	*H*	*H*
18MBH361T	*Business Communication & Value Science – III*	*H*	*H*	*H*	*H*	*H*	*M*	*L*	*M*	*H*	*M*	*M*	*H*	*H*	*H*	*M*
18MBH362T	*Business Communication & Value Science – IV*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*L*	*H*	*M*
18MBH363T	*Fundamentals of Management*	*H*	*H*	*M*	*M*	*H*	*L*	*L*	*M*	*H*	*M*	*L*	*H*	*L*	*H*	*H*
18MBH364T	*Business Strategy*	*H*	*H*	*H*	*H*	*L*	*L*	*L*	*L*	*M*	*M*	*L*	*H*	*H*	*H*	*H*
18MBH365T	*Financial and Cost Accounting*	*H*	*H*	*H*	*H*	*H*	*M*	*L*	*M*	*H*	*M*	*M*	*H*	*H*	*H*	*M*
18MBH461T	*Financial Management*	*H*	*H*	*H*	*H*	*H*	*M*	*L*	*M*	*H*	*M*	*M*	*H*	*H*	*H*	*M*
18MBH462T	*Human Resource Management*	*H*	*H*	*H*	*H*	*M*	*L*	*L*	*L*	*M*	*M*	*L*	*H*	*H*	*H*	*H*
18MBH463J	*Services Science and Service Operational Management*	*H*	*H*	*H*	*H*	*M*	*M*	*L*	*L*	*M*	*M*	*L*	*H*	*H*	*H*	*H*
18MBH464J	*IT Project Management*	*M*	*H*	*M*	*H*	*M*	*M*	*L*	*M*	*M*	*M*	*M*	*H*	*L*	*H*	*H*
18MBH465T	*Marketing Research and Marketing Management*	*M*	*H*	*H*	*H*	*H*	*M*	*L*	*M*	*M*	*M*	*M*	*H*	*L*	*H*	*H*
18CSC161J	*Fundamentals of Computer Science*	*H*	*H*	*H*	*M*	*H*	*M*	*L*	*M*	*H*	*M*	*M*	*H*	*L*	*H*	*H*
18CSC162J	*Data Structures and Algorithms*	*H*	*H*	*H*	*H*	*H*	*L*	*L*	*M*	*H*	*H*	*L*	*H*	*H*	*H*	*H*
18CSC261T	*Formal Language and Automata Theory*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*
18CSC262J	*Computer Organization and Architecture*	*H*	*H*	*H*	*H*	*H*	*M*	*L*	*M*	*H*	*M*	*M*	*H*	*H*	*H*	*M*
18CSC263J	*Object Oriented Programming*	*M*	*H*	*H*	*H*	*M*	*M*	*H*	*M*	*H*	*M*	*M*	*H*	*H*	*H*	*H*
18CSC264J	*Computational Statistics*	*H*	*H*	*H*	*H*	*H*	*M*	*M*	*M*	*M*	*M*	*M*	*H*	*L*	*H*	*H*
18CSC265J	*Software Engineering*	*H*	*H*	*H*	*H*	*H*	*H*	*L*	*M*	*H*	*M*	*M*	*H*	*M*	*H*	*H*
18CSC266J	*Operating Systems*	*H*	*H*	*H*	*H*	*M*	*H*	*H*	*M*	*H*	*M*	*H*	*H*	*H*	*M*	*H*
18CSC267J	*Database Management Systems*	*H*	*H*	*H*	*H*	*M*	*M*	*M*	*M*	*M*	*H*	*L*	*H*	*H*	*H*	*H*
18CSC268J	*Software Design with UML*	*H*	*H*	*H*	*H*	*M*	*M*	*M*	*M*	*M*	*H*	*L*	*H*	*H*	*H*	*H*
18CSC361J	*Design and Analysis of Algorithms*	*H*	*H*	*H*	*H*	*M*	*M*	*M*	*M*	*M*	*H*	*L*	*H*	*H*	*H*	*H*
18CSC362J	*Compiler Design*	*H*	*H*	*H*	*H*	*H*	*L*	*L*	*M*	*H*	*H*	*L*	*H*	*H*	*H*	*H*
18CSC363J	*Computer Networks*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*
18CSC364J	*Information Security*	*H*	*H*	*H*	*H*	*H*	*M*	*M*	*M*	*M*	*H*	*M*	*H*	*H*	*H*	*H*
18CSC365J	*Artificial Intelligence*	*M*	*H*	*H*	*H*	*H*	*M*	*L*	*M*	*M*	*H*	*M*	*H*	*M*	*H*	*H*
18CSC461J	*Usability Design of Software Applications*	*H*	*H*	*H*	*H*	*M*	*H*	*H*	*H*	*M*	*H*	*M*	*H*	*H*	*H*	*H*
18CSC462J	*IT Workshop using Scilab*	*M*	*H*	*H*	*H*	*H*	*M*	*M*	*M*	*M*	*H*	*M*	*H*	*H*	*H*	*H*
18CSP361L	*Mini Project – 1*	*H*	*M*	*M*	*M*	*M*	*M*	*M*	*M*	*H*	*H*	*H*	*M*	*H*	*H*	*H*
18CSP461L	*Project Evaluation – 1*	*H*	*M*	*M*	*M*	*M*	*M*	*M*	*M*	*H*	*H*	*H*	*M*	*H*	*H*	*H*
18CSP462L	*Project Evaluation – 2*	*H*	*H*	*H*	*H*	*H*	*M*	*M*	*H*	*H*	*H*	*H*	*H*	*H*	*M*	*M*
	Program Average	*H*	*H*	*M*	*H*	*M*	*L*	*M*	*L*	*M*	*M*	*M*	*H*	*M*	*M*	*M*

H – High Correlation, M – Medium Correlation, L – Low Correlation

20. (g) Implementation Plan: B.Tech. in Computer Science and Business Systems

Code	Semester - I Course Title	Hours/ Week L	T	P	C
18MBH161T	Business Communication & Value Science - I	2	0	0	2
18PYB161J	Fundamentals of Physics	2	0	2	3
18MAB165T	Discrete Mathematics	3	1	0	4
18MAB166T	Probability and Statistics	3	0	0	3
18EES161J	Principles of Electrical Engineering	2	0	2	3
18CSC161J	Fundamentals of Computer Science	3	0	4	5
18PDM101L	Professional Skills and Practices	0	0	2	0
18LEM101T	Constitution of India	1	0	0	0
18GNM101L	Physical and Mental Health using Yoga	0	0	2	0
	Total Learning Credits				**20**

Code	Semester - II Course Title	Hours/ Week L	T	P	C
18MBH162T	Business Communication & Value Science - II	2	0	0	2
18MBH163T	Fundamentals of Economics	2	0	0	2
18MAB163T	Linear Algebra	3	1	0	4
18MAB167J	Statistical Modeling	3	0	2	4
18EES162J	Principles of Electronics	2	0	2	3
18CSC162J	Data Structures and Algorithms	3	0	4	5
18LEM102J	Value Education	1	0	1	0
18GNM10XL	NCC / NSS / NSO	0	0	2	0
18LEM10XJ	Chinese / French / German / Japanese/ Korean	2	0	2	0
	Total Learning Credits				**20**

Code	Semester - III Course Title	Hours/ Week L	T	P	C
18MBH461T	Financial Management	2	0	0	2
18MBH462T	Human Resource Management	2	0	0	2
18CSC261T	Formal Language and Automata Theory	3	0	0	3
18CSC262J	Computer Organization and Architecture	3	0	2	4
18CSC263J	Object Oriented Programming	2	0	4	4
18CSC264J	Computational Statistics	3	0	2	4
18CSC265J	Software Engineering	3	0	2	4
18PDM201L	Competencies in Social Skills	0	0	2	0
	Total Learning Credits				**23**

Code	Semester - IV Course Title	Hours/ Week L	T	P	C
18MBH261T	Introduction to Innovation, IP Management andEntrepreneurship	3	0	0	3
18MBH465T	Marketing Research and Marketing Management	2	0	0	2
18MBH262J	Design Thinking	2	0	2	3
18MAB261J	Operations Research	2	0	2	3
18CSC266J	Operating Systems	3	0	2	4
18CSC267J	Database Management Systems	3	0	2	4
18CSC268J	Software Design with UML	2	0	2	3
18CSM261L	Competitive Professional Skills-I	0	0	2	0
18PDM202L	Critical and Creative Thinking Skills	0	0	2	0
18CYM101T	Environmental Science	1	0	0	0
	Total Learning Credits				**22**

Code	Semester - V Course Title	Hours/ Week L	T	P	C
18MBH361T	Business Communication & Value Science - III	2	0	0	2
18MBH363T	Fundamentals of Management	2	0	0	2
18MBH364T	Business Strategy	2	0	0	2
18CSC361J	Design and Analysis of Algorithms	3	0	2	4
18CSC362J	Compiler Design	3	0	2	4
	Professional Elective – 1	2	0	2	3
	Open Elective – 1	2	1	0	3
18CSP361L	Mini Project – 1	0	0	2	1
18CSM361L	Competitive Professional Skills-II	0	0	2	0
18PDM301L	Analytical and Logical Thinking Skills	0	0	2	0
18LEM109T	Indian Traditional Knowledge	1	0	0	0
	Total Learning Credits				**21**

Code	Semester - VI Course Title	Hours/ Week L	T	P	C
18MBH362T	Business Communication & Value Science - IV	2	0	0	2
18MBH365T	Financial and Cost Accounting	2	0	0	2
18CSC365J	Artificial Intelligence	3	0	2	4
18CSC364J	Information Security	3	0	2	4
18CSC363J	Computer Networks	3	0	2	4
	Professional Elective – 2	2	0	2	3
	Professional Elective – 3	2	0	2	3
18CSM362L	Competitive Professional Skills-III	0	0	2	0
18LEM110L	Indian Art Form	0	0	2	0
	Total Learning Credits				**22**

Code	Semester – VII Course Title	Hours/ Week L	T	P	C
18MBH463J	Services Science and Service Operational Management	3	0	2	4
18MBH464J	IT Project Management	3	0	2	4
18CSC461J	Usability Design of Software Applications	2	0	2	3
18CSC462J	IT Workshop using Scilab	1	0	2	2
	Professional Elective – 4	2	0	2	3
	Professional Elective – 5	2	0	2	3
18CSP461L	Project Evaluation – 1	0	0	6	3
	Total Learning Credits				22

Code	Semester - VIII Course Title	Hours/ Week L	T	P	C
18CSP462L	Project Evaluation –2	0	0	20	10
	Total Learning Credits				10

SEMESTER – I

Course Code	18MBH161T	Course Name	BUSINESS COMMUNICATION & VALUE SCIENCE – I	Course Category	H	Humanities and Social Sciences	L	T	P	C
							2	0	0	2

Pre-requisite Courses	Basic Knowledge of high school English	Co-requisite Courses	NA	Progressive Courses	NA
Course Offering Department	MBA	Data Book / Codes/Standards			

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	*Understand what life skills are and their importance in leading a happy and well-adjusted life*			
CLR-2 :	*Motivate students to look within and create a better version of self*			
CLR-3 :	*Introduce them to key concepts of values, life skills and business communication*			
CLR-4 :	*To recognize their own strength and opportunities*			
CLR-5 :	*Understand the basic skills in Business Communication*			
CLR-6 :	*Apply the learnt techniques in the business world.*			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	*Recognize the need for life skills and values*	*2*	*60*	*50*	*H*	*H*	*H*	*M*	*M*	*L*	*M*	*M*	*L*	*M*	*H*	*L*			
CLO-2 :	*Recognize own strengths and opportunities*	*2*	*80*	*70*	*H*	*H*	*L*	*L*	*M*	*M*	*M*	*L*	*L*	*M*	*H*	*H*			
CLO-3 :	*Apply the life skills to different situations*	*1*	*80*	*75*	*H*	*H*	*L*	*L*	*M*	*M*	*L*	*L*	*L*	*M*	*H*	*M*			
CLO-4 :	*Understand the basic tenets of communication*	*2*	*80*	*70*	*H*	*H*	*M*	*L*	*M*	*M*	*L*	*L*	*L*	*M*	*H*	*H*			
CLO-5 :	*Apply the basic communication practices in different types of communication*	*3*	*90*	*80*	*H*	*H*	*H*	*L*	*M*	*M*	*L*	*L*	*L*	*M*	*H*	*L*			
CLO-6 :	*Gain Knowledge in techniques of business communication and succeed in effective implementation in the corporate arena.*	*3*	*90*	*80*	*H*	*H*	*H*	*M*	*H*	*M*	*H*	*M*	*L*	*H*	*M*	*H*			

Duration (hour)		6	6	6	6	6
S-1	SLO-1	*Overview of Leadership Oriented Learning (LOL) Theory and Practice*	*Communication Skills: Overview of Communication Skills Barriers of communication, Effective communication Business communication*	*Verbal communication: clarity of speech Pronunciation*	*Understanding Life Skills: Movie based learning – Pursuit of Happiness. What are the skills and values you can identify, what Can you relate to? (Part 1) Post discussion*	*Life skill: Join a trek – Values to be learned: Leadership Types and styles*
	SLO-2	*Activity on introducing Self Introducing self and SWOT*	*Types of communication- verbal and non – verbal – Role-play based learning Importance of Questioning*	*Vocabulary Enrichment: Exposure to words from General Service List (GSL) by West, Academic word list (AWL) technical specific terms related to the field of technology, phrases, idioms, significant abbreviations formal business vocabulary Read Economic Times, Reader's Digest, National Geographic and take part in a GD, using the words you Learnt/liked from the articles. Group discussion using words learnt*	*Understanding Life Skills: Movie based learning – Pursuit of Happiness. What are the skills and values you can identify, what can you relate to? (Part 2) Post discussion*	*Life skill: Join a trek – Values to be learned: Team Work Activity*

Duration (hour)		6	6	6	6	6
S-2	SLO-1	*Class activity – presentation on favorite cricket captain in IPL The skills and values they demonstrate*	*Listening Skills: Law of nature- Importance of listening skills, Difference between listening and Hearing, Types of listening. Listening activity*	*Practice: Toastmaster style Table Topics speech with evaluation Activity*	*Understanding Life Skills: Movie based learning – Pursuit of Happiness. What are the skills and values you can identify, what can you relate to? (Part 3) Post discussion*	*Life skill: Join a trek – Values to be learned: Dealing with ambiguity Activity*
	SLO-2	*Self-work with immersion – interview a maid, watchman and Sweeper and narrate what you think are the values that drive them Report on interview*	*Expressing self On stage activity*	*Practice: Toastmaster style Table Topics speech with evaluation 2 Activity*	*Introduction to life skills What are the critical life skills Current trend*	*Life skill: Join a trek – Values to be learned: Managing stress Yoga*
S-3	SLO-1	*Self-work with immersion – interview a cab driver, beggar and narrate what you think are the values that drive them Report on interview*	*Connecting with emotions Best moments*	*Written Communication: Summary writing, story writing Various scenario*	*Multiple Intelligences Embracing diversity – Activity on appreciation of diversity Post activity discussion*	*Life skill: Join a trek – Values to be learned: Motivating people Intrinsic and extrinsic*
	SLO-2	*Overview of business communication Types and techniques*	*Visualizing Visual Activity*	*Build your CV –start writing your comprehensive CV including every achievement in your life, no format, no page limit Mistakes to avoid in CV*	*Life skill: Community service– work with an NGO and make a Presentation (Part 1) Team outing*	*Life skill: Join a trek – Values to be learned: Creativity Special Activity*
S-4	SLO-1	*Activity: Write a newspaper report on an IPL match Compare the report with friends*	*Experiencing Purpose Discussion*	*Project: Create a podcast on a topic that will interest college students Activity*	*Life skill: Community service– work with an NGO and make a Presentation (Part 2) Team outing*	*Life skill: Join a trek – Values to be learned: Result Orientation Assessment*
	SLO-2	*Activity: Record a conversation between a celebrity and an interviewer. Quiz Time*	*Activity: Skit based on communication skills*	*Life skill: Stress management Causes of stress*	*Life skill: Community service– work with an NGO and make a Presentation (Part 3) Team outing*	*Life skill: Join a trek – Values to be learned: Motivating people (2) Intrinsic and extrinsic*
S-5	SLO-1	*Self-Awareness: Identity Self-assessment Self-Awareness: Body Awareness Self-Awareness: Stress Management*	*Activity: Skit 2 based on communication skills. Record skit. Activity: Skit 3 based on communication skills. Activity: Skit 4 based on communication skills*	*Life skill: working with rhythm Activity. Life skill: Balance. Life skill: Team Work*	*Life skill: Community service– work with an NGO and make a Presentation (Part 4) Team outing. Life skill: Community service– work with an NGO and make a Presentation (Part 5) Life skill: Community service– work with an NGO and make a Presentation (Part 6)*	*Life skill: Join a trek – Values to be learned: Dealing with ambiguity Activity Life skill: Join a trek – Values to be learned: Motivating people (3) Life skill: Join a trek – Values to be learned: Creativity (2)*
	SLO-2	*Essential Grammar – I: Refresher on Parts of Speech – Listen to an audio clip and note down the different parts of speech followed by discussion. Tenses: Applications of tenses in Functional Grammar – Take a quiz and then discuss*	*Evaluation on Listening skills – listen to recording and answer questions based on them. Evaluate audio clip*	*Project: Create a musical using the learnings from unit. Activity*	*Life skill: Community service– work with an NGO and make a Presentation (Part 7) Team outing*	*Life skill: Join a trek – Values to be learned: Creativity (3). Adzap*
S-6	SLO-1	*Sentence formation (general & Technical), Common errors, Voices. Show sequence from film where a character uses wrong Sentence structure*	*Email writing: Formal and informal emails, activity*	*Project: Create a musical using the learnings from unit (2)*	*Community Service :work with an NGO and make a Presentation (Part 7)*	*Life skill: Join a trek – Values to be learned: Result Orientation (2)*

Duration (hour)		6	6	6	6	6
	SLO-2	*(e.g. Zindagi Na MilegiDobara where the characters use 'the' before every word)*	*Paper and web based*	*Activity*	*Team outing*	*Activity*

Learning Resources	*1. English vocabulary in use – Alan Mc'carthy and O'dell* *2. APAART: Speak Well 1 (English language and communication*	*3. APAART: Speak Well 2 (Soft Skills)* *4. Bernadin , Human Resource Management ,Tata Mcgraw Hill ,8th edition 2012. Wayne Cascio, Managing Human Resource, McGraw Hill, 2007.*

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%	-	30%	-	30%	-	40%	-	30%	-
	Understand										
Level 2	Apply	40%	-	40%	-	40%	-	30%	-	40%	-
	Analyze										
Level 3	Evaluate	30%	-	30%	-	30%	-	30%	-	30%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions I	Internal Experts
Experts From TCS	*Dr.K.Latha, Chandasekara University, Kanchipuram*	*Mr.Vijay Raja, Assistant Professor, SRMSOM*
	Dr.Thenmozhi, Professor, University of Madras	*Dr.SanthoshKumart, Head – Human Resources , SRMSOM*

Course Code	18PYB161J	Course Name	FUNDAMENTALS OF PHYSICS	Course Category	B	Basic Sciences	L	T	P	C
							2	0	2	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Physics and Nanotechnology	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	*Understand the concepts of periodic motion*	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLR-2 :	*Create insights to the concepts of optical effects*																		
CLR-3 :	*Identify the applications of lasers and optical fibers*																		
CLR-4 :	*Identify the significance of quantum theory*																		
CLR-5 :	*Analyze the principles of thermodynamics*																		
CLR-6 :	*Utilize the concepts of physics for application in engineering and technology*																		
Course Learning Outcomes (CLO):	**At the end of this course, learners will be able to:**																		
CLO-1 :	*Apply the periodic motion to different systems*	2	85	75	H	H	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-2 :	*Apply ray propagation and optical effects*	2	85	75	H	H	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-3 :	*Identify the applications of lasers and optical fiber*	2	75	70	H	-	-	H	-	-	-	-	-	-	-	-	-	-	-
CLO-4 :	*Apply quantum mechanics to basic physical problems*	2	85	80	H	H	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-5 :	*Analyze the thermodynamic process*	2	85	75	H	-	H	-	-	-	-	-	-	-	-	-	-	-	-
CLO-6 :	*Apply the concepts of optics, quantum theory and thermodynamics in real problems*	2	80	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	*Introduction to periodic motion*	*Theory of interference fringes*	*Absorption and emission processes-two level system*	*Introduction to Quantum Mechanics, Planck's hypothesis*	*X-ray Diffraction, Debye Scherrer powder*
	SLO-2	*Simple harmonic motion-characteristics of simple harmonic motion*	*Types of interference*	*Einstein's theory of matter radiation A and B coefficients*	*de Broglie hypothesis for matter waves*	*Laue Method*
S-2	SLO-1	*Vibration of simple springs mass system*	*Fresnel's prism*	*Characteristics of laser beams*	*Heisenberg Uncertainty principle*	*Concept of band gap*
	SLO-2	*Characteristic of mass-spring system*	*Newton's rings*	*Essential components of laser system and pumping mechanisms*	*Physical significance of wave function*	*Conductor, semiconductor, and insulator*
S-3	SLO-1	*Resonance-definition.*	*Diffraction-types of diffraction*	*Threshold population inversion*	*Time independent Schrödinger's wave equation*	*Concept of Band theory: basic idea*
	SLO-2	*Damped harmonic oscillator*	*Difference between interference and diffraction*	*CO2 Laser*	*Time dependent Schrödinger's wave equation*	*Formation of Band gap*
S-4-5	SLO-1	*Lab 1: Basics of experimentation*	*Lab 3:Study of I-V characteristics of a light dependent resistor (LDR)*	*Lab 5: Determine the wavelength of monochromatic light Newton's ring*	*Lab 7 : Determine Particle size by using laser light*	*Lab 9: Determine of Hall coefficient of semiconductor*
	SLO-2					
S-6	SLO-1	*Heavy, critical and light damping*	*Fresnel's half period zone and zone plate*	*Ruby laser*	*Particle in a 1 D box*	*Laws of thermodynamics-Zeroth law of thermodynamics*

Duration (hour)		12	12	12	12	12
	SLO-2	*Energy decay in a damped harmonic oscillator*	*Fraunhofer diffraction at single slit-plane*	*Nd-YaG laser*	*Normalization and Eigen values*	*First law of thermodynamics*
S-7	SLO-1	*Quality factor*	*Plane diffraction grating*	*Application of Laser in engineering*	*Crystallography: Introduction, Basic terms-types of crystal systems*	*Brief discussion on application of first law*
	SLO-2	*Quality factor of Different oscillators*	*Temporal and Spatial Coherence*	*Holography*	*Bravais lattices, miller indices d spacing*	*Second law of thermodynamics*
S-8	SLO-1	*Forced mechanical*	*Polarization*	*Optical fiber-physical structure*	*Crystal Symmetry*	*Concept of Engine*
	SLO-2	*Electrical oscillator*	*Concept of production of polarized beam of light from two SHM acting at right angles*	*Total internal reflection*	*Plane of Symmetry, Axis of Symmetry*	*Efficiency of engine*
S-9-10	SLO-1	*Lab 2: Determine spring constant – expansion of a helical spring*	*Lab 4: Determine Planck's constant*	*Lab 6: Determine laser parameters – divergence and wavelength for a given laser source*	*Lab 8:- Study of attenuation and propagation characteristics of optical fiber*	*Lab 10 : Mini Project*
	SLO-2					
S-11	SLO-1	*Del, divergence, curl and gradient operations in vector calculus*	*Production of Plane polarized light*	*Numerical aperture*	*Coordination number, Atomic Packing Fraction*	*Entropy and internal energy*
	SLO-2	*Gauss-divergence and Stoke's theorem*	*Circularly and Elliptically polarized light*	*Acceptance angle*	*Atomic Packing fraction for SC, BCC*	*Entropy as a thermodynamic parameter*
S-12	SLO-1	*Maxwell's equations*	*Production of Circularly polarized light*	*Classification of optical fibers : Mode*	*Atomic Packing fraction for FCC*	*Change of Entropy in reversible process*
	SLO-2	*Maxwell's equations*	*Brewster's Law, Double refraction*	*Classification of optical fibers : Refractive index*	*Atomic Packing fraction for HCP*	*Change of Entropy in irrreversible process*

Learning Resources		
	1. *David Jeffery Griffiths, Introduction to Electrodynamics, Revised Edition, Pearson, 2013*	3. *David Halliday, Fundamentals of Physics, 7th Edition, John Wiley & Sons Australia, Ltd, 2015*
	2. *Ajay Ghatak, Optics, Tata McGraw Hill Education, 5th Edition, 2016*	4. *Eisberg and Resnick, Quantum Physics: of Atoms, Molecules, Solids, Nuclei and Particles, 6th Edition, 2015*

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert from TCS	Prof . V. Subramanian, IITM, Chennai, manianvs@iitm.ac.in	Dr.M.Krishnamohan, SRMIST
	Prof . C. Venkateswaran, University of Madras, Chennai, cvenkateswaran@unom.ac.in	Dr.TrilochanSahoo, SRMIST

Course Code	18MAB165T	Course Name	DISCRETE MATHEMATICS	Course Category	B	Basic Sciences	L	T	P	C
							3	1	0	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	
Course Offering Department	Mathematics	Data Book / Codes/Standards		Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Apply Boolean algebra,truth table,logic gates,in computer science andcommunication .	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLR-2 :	Apply set theory, relations in storage, communication and manipulation of data. Learning about groups, rings and fields. Using them to solveengineering related problems																		
CLR-3 :	Using combinatory, counting problems, generating functions, recurrence relations in computer network .Apply principle of Mathematical induction and Pigeon hole principle.																		
CLR-4 :	Understand the basic concepts in Graph Theory																		
CLR-5 :	Understand the basic concepts in Logic																		
CLR-6 :	Utilize the concepts in Discrete Mathematics for the understanding of Engineering and Technology																		
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																		
CLO-1 :	Gaining knowledge in Boolean arithmetic to solve problems using logic gates.	2	85	80	M	H	L						M	L		H			
CLO-2 :	Problem solving in sets and relations.Gaining knowledge in groups, rings and fields. Solving simple problems using elementary concepts.	2	85	80	M	H		M	M				M			H			
CLO-3 :	Solving problems in basic counting principles, inclusion exclusion and number theory.	2	85	80	M	H							M			H			
CLO-4 :	Solving problems in Graph Theory and its applications.	2	85	80	M	H		M					M			H			
CLO-5 :	Solving problems in Logic and its applications.	2	85	80	M	H	L						M	L		H			
CLO-6 :	Apply the concepts of Boolean Algebra, Abstract Algebra, counting principles, recurrence relations, Logic and Graph theory in real world problems related to Computer Science and Business systems	2	85	80	M	H	L						M	L		H			

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3`	Learning Unit / Module 4	Learning Unit / Module 5
		12	12	12	12	12
S-1	SLO-1	Introduction to Boolean Algebra- basic definitions.	Introduction to Sets – simple examples.	Basic counting-Permutation and Combination	Basic concepts of Graphs	Propositional calculus
	SLO-2	Axiomatic definition of Boolean Algebra, logic gates.	Properties of sets	Basic counting-Permutation and Combination	Complement	Propositions
S-2	SLO-1	Postulates of Boolean Algebra.	Relations- definitions and examples.	Balls and bins problems.	Isomorphism	Connectives
	SLO-2	Postulates of Boolean Algebra.	Relations- definitions and examples.	Balls and bins problems.	Connectedness	Syntax
S-3	SLO-1	Problems using the postulates of Boolean Algebra	Problems on relations- types of relations.	Balls and bins problems.	Reachability	Semantics
	SLO-2	Problems using the postulates of Boolean Algebra	Problems on relations- types of relations.	Balls and bins problems.	Adjacency matrix	Truth assignments and truth tables
S-4	SLO-1	Problem solving using tutorial sheet 1	Problem solving using tutorial sheet 4	Problem solving using tutorial sheet 7	Problem solving using tutorial sheet 10	Problem solving using tutorial sheet 13

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3`	Learning Unit / Module 4	Learning Unit / Module 5
		12	12	12	12	12
	SLO-2	*Problem solving using tutorial sheet 1*	*Problem solving using tutorial sheet 4*	*Problem solving using tutorial sheet 7*	*Problem solving using tutorial sheet 10*	*Problem solving using tutorial sheet 13*
S-5	SLO-1	*Principle of Duality.*	*Binary operation on a set- Groups and axioms of groups.*	*Generating functions*	*Eulerian paths*	*Validity*
	SLO-2	*Principle of Duality.*	*Properties of groups.*	*Problems on generating functions*	*Circuits in graphs and digraphs*	*Satisfiability*
S-6	SLO-1	*Problems based on principle of Duality*	*Examples of groups.*	*Problems on generating functions*	*Hamiltonian paths and circuits*	*Tautology*
	SLO-2	*Problems based on principle of Duality.*	*Permutation group, equivalence classes with addition modulo m and multiplication modulo m.*	*Problems on generating functions*	*Tournaments*	*Adequate set of connectives*
S-7	SLO-1	*Canonical forms.*	*Cyclic groups and properties.*	*Recurrence relations problems*	*Trees*	*Equivalence*
	SLO-2	*Minterms and maxterms, sum of minterms, product of maxterms,*	*Subgroups and necessary and sufficiency of a subset to be a subgroup.*	*Recurrence relations problems*	*Planar graphs*	*Normal forms*
S-8	SLO-1	*Problem solving using tutorial sheet 2 in duality and minterm and maxterm concepts.*	*Problem solving using tutorial sheet 5*	*Problem solving using tutorial sheet 8*	*Problem solving using tutorial sheet 11*	*Problem solving using tutorial sheet 14*
	SLO-2	*Problem solving using tutorial sheet 2 in duality and minterm and maxterm concepts.*	*Problem solving using tutorial sheet 5*	*Problem solving using tutorial sheet 8*	*Problem solving using tutorial sheet 11*	*Problem solving using tutorial sheet 14*
S-9	SLO-1	*Conversion between canonical forms.*	*Cosets and examples.*	*Recurrence relations problems*	*Euler's formula*	*Compactness*
	SLO-2	*Conversion between canonical forms.*	*Rings- definition and examples. Properties*	*Recurrence relations problems*	*Dual of a planer graph*	*Resolution*
S-10	SLO-1	*Karnaugh maps.*	*Special classes of rings*	*Proof techniques- principle of Mathematical induction*	*Independence number and clique number*	*Formal reducibility*
	SLO-2	*Two and three variable maps.*	*Ideal and Quotient rings.*	*Problems using the principle of Mathematical induction*	*Independence number and clique number*	*Natural deduction system and axiom system*
S-11	SLO-1	*Four variable maps.*	*Fields – definition and examples.*	*Pigeon hole principle*	*Chromatic number*	*Soundness*
	SLO-2	*Five and six variable maps.*	*Fields – definition and examples.*	*Problems on pigeon hole principle.*	*Statement of Four-color theorem*	*completeness*
S-12	SLO-1	*Problem solving using tutorial sheet 3 for conversion between canonical forms.*	*Problem solving using tutorial sheet 6*	*Problem solving using tutorial sheet 9*	*Problem solving using tutorial sheet 12*	*Problem solving using tutorial sheet 15*
	SLO-2	*Problem solving using tutorial sheet 3 using K-maps.*	*Problem solving using tutorial sheet 6*	*Problem solving using tutorial sheet 9*	*Problem solving using tutorial sheet 12*	*Problem solving using tutorial sheet 15*

	REFERENCE BOOKS/OTHER READING MATERIAL
	Text Book
1	I. N. Herstein, "Topics in Algebra", John Wiley andSons
2	M. Morris Mano, "Digital Logic & Computer Design",Pearson
3	*Elements of Discrete Mathematics,* (Second Edition) C. L. LiuMcGraw Hill, New Delhi.
4	*Graph Theory with Applications,* J. A. Bondy and U. S. R. Murty, Macmillan Press, London.
5	*Mathematical Logic for Computer Science,*L. Zhongwan, World Scientific, Singapore.
	Reference Book
1	*Introduction to linear algebra.* Gilbert Strang.
2	*Introductory Combinatorics,* R. A. Brualdi, North-Holland, New York.
3	*Graph Theory with Applications to Engineering and Computer Science,* N. Deo, Prentice Hall, Englewood Cliffs.
4	*Introduction to Mathematical Logic,*(Second Edition), E. Mendelsohn, Van-Nostrand, London

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*40%*	-	*30%*	-	*30%*	-	*30%*	-	*30%*	-
	Understand										
Level 2	Apply	*40%*	-	*40%*	-	*40%*	-	*40%*	-	*40%*	-
	Analyze										
Level 3	Evaluate	*20%*	-	*30%*	-	*30%*	-	*30%*	-	*30%*	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

 # CLA –4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

SLO – Session Learning Outcome

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert from TCS	*Dr.K.C.Sivakumar, IIT, Madras, kcskumar@iitm.ac.in*	*Dr.A.Govindarajan*
		Dr.N.Parvathi

Course Code	18MAB166T	Course Name	PROBABILITY AND STATISTICS	Course Category	B	Basic Sciences	L	T	P	C
							3	0	0	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics	Data Book / Codes/Standards		Statistical tables	

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	*To apply the basic rules and theorems of probability theory such as Baye's Theorem, to determine probabilities that help to solve engineering problems and to determine the expectation and variance of a random variable from its distribution.*
CLR-2 :	*To appropriately choose, define probability distributions such as the Binomial, Poisson and Normal etc to model and solve engineering problems.*
CLR-3 :	*To learn the basics of statistics, collection, estimate of statistical data*
CLR-4 :	*To understand measures of central tendency and how correlation and regression analysis can be used to develop an equation that estimates how two variables are related*
CLR-5 :	*To comprehend the applications of differential and integral calculus*
CLR-6 :	*Acquired the knowledge of statistics Probability and calculus applications to the computer science and business systems*

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning 1: Level of Thinking (Bloom)	Learning 2: Expected Proficiency (%)	Learning 3: Expected Attainment (%)	PLO 1: Engineering Knowledge	PLO 2: Problem Analysis	PLO 3: Design & Development	PLO 4: Analysis, Design, Research	PLO 5: Modern Tool Usage	PLO 6: Society & Culture	PLO 7: Environment & Sustainability	PLO 8: Ethics	PLO 9: Individual & Team Work	PLO 10: Communication	PLO 11: Project Mgt. & Finance	PLO 12: Life Long Learning	PLO 13: PSO - 1	PLO 14: PSO - 2	PLO 15: PSO – 3
CLO-1 :	*Pertain the Knowledge of probability concepts, to determine probabilities that help to solve engineering problems. and to determine the expectation and variance of a random variable from its distribution*	*3*	*85*	*80*	*M*	*H*	*L*						*M*	*L*		*H*			
CLO-2 :	*Gain familiarity in deriving probability distributions such as the Binomial, Poisson and Normal etc and apply them tn the problems involving Science and Engineering*	*3*	*85*	*80*	*M*	*H*		*M*	*M*										
CLO-3 :	*Acquire knowledge in descriptive statistics*	*3*	*85*	*80*		*M*							*M*			*H*			
CLO-4 :	*Getting the knowledge of measures of central tendency and dispersion, correlation, regression analysis and apply them in the problems in Science and Engineering*	*3*	*85*	*80*	*M*	*H*	*L*	*M*					*M*	*L*		*H*			
CLO-5 :	*Understanding the concept differential and integral calculus*	*3*	*85*	*80*		*M*	*H*	*M*					*M*			*H*			
CLO-6 :	*To solve the problems based on statistics, probability and calculus in computer science and business systems*	*3*	*85*	*80*	*M*	*H*							*M*			*H*			

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		12	12	12	12	12
S-1	SLO-1	*probability concepts, Types of experiments, Events, sample space, combinatorial probability*	*Discrete distributions*	*Definition of Statistics*	*Descriptive measures*	*Differential calculus introduction*
	SLO-2	*Axioms and theorems*	*Binomial distribution*	*Basic objectives*	*central tendency*	*Successive differentiation.*
S-2	SLO-1	*Conditional probability Baye's theorem – without proof*	*Fitting binomial distribution*	*Applications in various branches of science with examples*	*Mean, median and mode*	*Taylor's series simple problems*
	SLO-2	*Applications- Baye's Theorem.*	*Poisson distribution*	*More examples*	*Problems on mean*	*Taylor's series simple problems*
S-3	SLO-1	*Random variables – Discrete case*	*Fitting Poisson distribution*	*Collection of Data, internal and external data*	*Problems on median and mode*	*Problems on radius of curvature and centre of curvature.*
	SLO-2	*Probability Mass function*	*Applications of binomial and Poisson distribution*	*Primary and secondary data*	*Dispersion*	*Problems on radius of curvature and centre of curvature.*
S-4	SLO-1	*Problem solving using tutorial sheet 1*	*Problem solving using tutorial sheet 4*	*Problem solving using tutorial sheet 7*	*Range*	*Problem solving using tutorial sheet 13*
	SLO-2	*Problem solving using tutorial sheet 1*	*Problem solving using tutorial sheet 4*	*Problem solving using tutorial sheet 7*	*Quartile deviation*	*Problem solving using tutorial sheet 13*

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		12	12	12	12	12
S-5	SLO-1	*Cumulative distribution function*	*Geometric distribution*	*Population and sample*	*Standard deviation*	*Problems on radius of curvature and centre of curvature.*
	SLO-2	*Mathematical expectation –discrete case*	*Memory less property*	*Representative sample*	*Standard deviation*	*Problems on radius of curvature and centre of curvature.*
S-6	SLO-1	*Variance*	*Continuous distribution: Uniform distribution*	*Descriptive Statistics,*	*Coefficient of variation*	*Integral calculus-reduction formulae*
	SLO-2	*Probability density function*	*Applications of Uniform distribution*	*Classification of Univariate data*	*Coefficient of variation*	*Problems based on reduction formulae.*
S-7	SLO-1	*Cumulative distribution function*	*Exponential distribution, Memory less property*	*tabulation of univariate data*	*Problems based on dispersion*	*Definite integrals properties without proof.*
	SLO-2	*Mathematical expectation-continuous case*	*Applications of exponential distribution*	*Applications of descriptive statistics*	*Problems based on dispersion*	*Problems based on definite integral properties.*
S-8	SLO-1	*Problem solving using tutorial sheet 2*	*Problem solving using tutorial sheet 5*	*Problem solving using tutorial sheet 8*	*Problem solving using tutorial sheet 11*	*Problem solving using tutorial sheet 14*
	SLO-2	*Problem solving using tutorial sheet 2*	*Problem solving using tutorial sheet 5*	*Problem solving using tutorial sheet 8*	*Problem solving using tutorial sheet 11*	*Problem solving using tutorial sheet 14*
S-9	SLO-1	*Variance*	*Normal distribution*	*Graphical representation*	*Bivariate data. Summarization*	*Double integrals*
	SLO-2	*Raw Moments*	*Applications of normal distribution*	*Graphical representation*	*marginal and conditional frequency distribution*	*Double integrals problems*
S-10	SLO-1	*Central Moments*	*Chi-Square distribution*	*Applications of graphical representation*	*marginal and conditional frequency distribution*	*Changing the order of integration.*
	SLO-2	*Moment generating function*	*Applications of Chi- square distribution*	*Frequency curves*	*Problems on marginal and conditional frequency distribution*	*Area enclosed by plane curves*
S-11	SLO-1	*MGF- discrete random variable*	*t- Distribution, F- Distribution*	*Frequency curves*	*Applications central tendency and dispersion*	*Volume of solids- volume as double integrals*
	SLO-2	*MGF- continous random variable*	*Applications of t, F- distributions*	*Applications of Frequency curves*	*Applications central tendency and dispersion*	*Volume of solids- volume as triple integrals*
S-12	SLO-1	*Problem solving using tutorial sheet 3*	*Problem solving using tutorial sheet 6*	*Problem solving using tutorial sheet 9*	*Problem solving using tutorial sheet 12*	*Problem solving using tutorial sheet 15*
	SLO-2	*Applications of Probability in Engineering field*	*Application of distributions in Engineering*	*Applications and the importance of descriptive statistics*	*Engineering Applications of Correlation and Regression*	*Applications of Differential and integral calculus in Engineering.*

Learning Resources	1. S.M. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002. 2. A. M. Gun, M.K. Gupta and B. Dasgupta, "Fundamentals of Statistics", vol. I & II, WorldPress, 2016. 3. I. R. Miller, J.E. Freund and Richard. A.. Johnson, "Probability and Statistics for Engineers". Eighth Edition,PHI, 2015 . 4. A. M. Mood, F.A. Graybill and D.C. Boes, "Introduction to the Theory of Statistics", McGraw Hill, Third edition, 2017. 5. T. Veerarajan, Probability and Statistics, Tata McGraw- Hill, New Delhi, 2010 6. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publication, Delhi. 7. Advanced Engineering Mathematics, (Second Edition) M. D. Greenberg, Pearson Education.

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	40%	-	30%	-	30%	-	30%	-	30%	-
	Understand										
Level 2	Apply	40%	-	40%	-	40%	-	40%	-	40%	-
	Analyze										
Level 3	Evaluate	20%	-	30%	-	30%	-	30%	-	30%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100%	

CLA –4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,
SLO – Session Learning Outcome

Course Designers		
Experts from Industry	*Experts from Higher Technical Institutions*	*Internal Experts*
Expert from TCS	*Dr.K.C.Sivakumar, IIT, Madras, kcskumar@iitm.ac.in*	*Dr.A.Govindarajan*
		Prof.Ganapathy Subramanian

Course Code	18EES161J	Course Name	PRINCIPLES OF ELECTRICAL ENGINEERING	Course Category	S	Engineering Sciences	L	T	P	C
							2	0	2	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Engineering	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*
CLR-1 :	*Analyze DC circuits using network theorems*
CLR-2 :	*Examine single phase AC series circuit and parallel circuits. Also understand the basics of three phase circuits*
CLR-3 :	*Introduce the basic concepts of electrostatics and magnetostatics*
CLR-4 :	*Comprehend the construction, working and performance of transformers and DC machines*
CLR-5 :	*Outline the concepts of transducers, measuring devices, electrical wiring and illumination*
CLR-6 :	*Enrich the concepts of electric circuits, flux distribution and electrical wiring*

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	*Compute the various electrical quantities in a DC circuit*	3	85	80	H	H	M			-	-		M	-	-		-	-	-
CLO-2 :	*Determine the parameters involved in AC circuits.*	3	85	80	H	H	M			-	-		M	-	-		-	-	-
CLO-3 :	*Understand the electric , magnetic flux distribution and their applications*	2	85	80	H	H	M		M	-	-		M	-	-		-	-	-
CLO-4 :	*Recall the working of transformers and electrical machines*	2	85	80	H	L				-	-		M	-	-		-	-	-
CLO-5 :	*Explain the operation of various transducers, sensors and wiring schemes*	2	85	80	H					-	-		M	-	-		-	-	-
CLO-6 :	*Gain knowledge on the basics of electrical and magnetic circuits, measuring devices , transducers and wiring*	2	85	80	H	H	M		M	-	-		M	-	-		-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	*Fundamental of passive and active elements-VI relationship*	*Introduction to AC Circuits*	*Principle of Electrostatics*	*Introduction to Electrostatic devices*	*Introduction tomeasuring devices and Sensors*
	SLO-2	*Concept of Potential difference, voltage, current-Ohm's law*	*Definition : Average value, RMS value, form factor and peak factor of AC waveform*	*Electrostatic field, electric field intensity, electric flux density, absolute permittivity, relative permittivity*	*Energy conversion in Electrostatic device*	*Basic concept of indicating and integrating instruments*
S-2	SLO-1	*Electric networks- Terminology and symbols-voltage source and current sources, ideal and practical*	*Form factor and peak factor : Half wave rectifier, full wave rectifier*	*Coulomb's law, capacitor composite, dielectric capacitors*	*Construction of Single phase transformer*	*Concepts of Digital instruments: Digital Ammeter*
	SLO-2	*Concept of work, power, energy and conversion of energy*	*Form factor and peak factor : Triangular wave , trapezoidal wave*	*capacitors in series& parallel, energy stored in capacitors, charging and discharging of capacitors*	*principle of operation of Single phase transformer*	*Digital multimeter, Digital storage oscilloscope*
S-3 to 4	SLO-1	*Lab 1:Demonstration of measurement of electrical quantities in DC systems*	*Lab 4:Verification of Superposition, Maximum Power Transfer theorem*	*Lab 7: Simulation of simple solenoid using FEM software*	*Lab 10 : Verification of relation in between voltage and current in three phase balanced delta connected loads*	*Lab 13 :Familiarization of electrical Elements, sources and measuring devices related to electrical circuits*
	SLO-2					
S-5	SLO-1	*Introduction to DC Circuits-Verification of KCL-KVL*	*Phasor representation in polar and rectangular form*	*Electro-mechanics: Electricity and Magnetism, Magnetic field*	*EMF equation*	*Active and passive transducers*
	SLO-2	*Network solutions using Mesh analysis*	*Star/Delta transformation*	*faraday's law - self and mutual inductance*	*Problems in EMF equation*	*Capacitive transducers, Inductive transducers, LVDT*

Duration (hour)		12	12	12	12	12
S-6	SLO-1	*Nodal analysis*	*Derive the Impedance, Admittance, active, reactive and apparent power, power factor of R-L excited by AC*	*Ampere's law- Magnetic flux density and Magnetic field intensity*	*voltage ratio, current ratio, KVA rating*	*Electrical Strain Gauges, PIR sensor,*
	SLO-2	*Simplifications of networks using series-parallel*	*Derive the Impedance, Admittance, active, reactive and apparent power, power factor of R-C circuit excited by AC*	*Magnetic circuit, Magnetic material and B-H Curve*	*Efficiency and regulation.*	*Proximity Sensor, Hall effect sensors*
S-7 to 8	SLO-1	*Lab 2:Circuit reduction and basic laws*	*Lab 5: Simulation of Time domain analysis of R-C transient circuit*	*Lab 8 : Simulation of Time domain analysis of R-L-C transient circuit for XL> XC, XL< XC& XL = XC*	*Lab 11 : Demo on single phase transformer*	*Lab 14 :Determination of resistance temperaturecoefficient*
	SLO-2					
S-9	SLO-1	*Superposition theorem in DC circuits*	*Derive the Impedance, Admittance, active, reactive and apparent power, power factor of R-L-C series circuit excited by AC supply*	*Magnetostatics Vs Electrostatics*	*Application to electromechanical devices: DC motor*	*Electrical Wiring and Illumination system*
	SLO-2	*Thevenin'stheorem in DC circuits*	*Derive the Impedance, Admittance, active, reactive and apparent power, power factor of R-L-C parallel circuit excited by AC supply*	*Application of Electrostatics and Magnetostatics*	*Types of DC motors*	*Types of lighting system-lamps Incandescent Fluorescent, CFL Sodium Vapour lamp, Mercury Vapour lamp, Metal Halidelamp*
S-10	SLO-1	*Norton's theorem in DC circuits*	*Star connected 3 phase balanced AC circuits*	*Principle and types of batteries*	*Construction and operation DC motors*	*Necessity of earthing*
	SLO-2	*Maximum Power Transfer theorem in DC circuits*	*Delta connected 3 phase balanced AC circuits.*	*Construction and application of battery*	*Characteristics of DC motor*	*Types of earthing*
S-11 to 12	SLO-1	*Lab 3:Verification of Thevenin's and Norton's theorem*	*Lab 6: Simulation of Time domain analysis of R-L transient circuit*	*Lab 9 :Verification of relation in between voltage and current in three phase balanced star connected loads.*	*Lab 12: Demo on Electrical Machine*	*Lab 15 : Familiarization of transducers related to electrical circuit*
	SLO-2					
	SLO-2					

Learning Resources		
	1. *Dash.S.S,Subramani.C,Vijayakumar.K,BasicElectricalEngineering,1sted.,VijayNicole,2013.* 2. *Jegatheesan .R, Analysis of Electric Circuits, Tata McGraw-Hill,2014.* 3. *Vincent.Del.Toro,"ElectricalEngineeringFundamentals",SecondEdition,PrenticeHallIndia*	4. *S.K. Bhattacharya Basic Electrical and Electronics Engineering, Second edition, Pearson Education, 2017.* 5. *R. Muthusubramanian, S. Salivahanan,"Basic Electrical and Electronics Engineering, Tata McGraw-Hill, 2012.*

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Experts From TCS		1. Mr.B.VinothKumar,SRMIST
		2.Mr.T.Vigneswaran,SRMIST

Course Code	18CSC161J	Course Name	FUNDAMENTALS OF COMPUTER SCIENCE	Course Category	C	Professional Core	L	T	P	C
							3	0	4	5

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Engineering	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	*Think and evolve a logically to construct an algorithm into a flowchart and a pseudocode that can be programmed*
CLR-2 :	*Utilize the various operators ,expressions and programming constructs to solve problems in engineering and real-time*
CLR-3 :	*Utilize custom designed functions and that can be used to perform tasks and can be repeatedly used in any application*
CLR-4 :	*Store and retrieve data in a single and multidimensional array along with references*
CLR-5 :	*Create storage constructs using structure and unions. Create and Utilize files to store and retrieve information*
CLR-6 :	*Create a logical mindset to solve various engineering applications using programming constructs in C*

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning 1: Level of Thinking (Bloom)	2: Expected Proficiency (%)	3: Expected Attainment (%)
CLO-1 :	*Identify methods to solve a problem through computer programming. List the basic data types and variables in C*	2	85	80
CLO-2 :	*Apply the logic operators and expressions. Use loop constructs and recursion. Use array to store and retrieve data*	3	85	80
CLO-3 :	*Analyze programs that need storage and form single and multi-dimensional arrays. Use pointer and preprocessor constructs in C*	3	85	80
CLO-4 :	*Create user defined functions for mathematical and other logical operations. Use pointer to address memory and data*	3	85	80
CLO-5 :	*Create structures and unions to represent data constructs. Use files to store and retrieve data*	3	85	80
CLO-6 :	*Apply programming concepts to solve problems. Learn about how C programming can be effectively used for solutions*	3	85	80

Program Learning Outcomes (PLO)	1 Engineering Knowledge	2 Problem Analysis	3 Design & Development	4 Analysis, Design, Research	5 Modern Tool Usage	6 Society & Culture	7 Environment & Sustainability	8 Ethics	9 Individual & Team Work	10 Communication	11 Project Mgt. & Finance	12 Life Long Learning	13 PSO - 1	14 PSO - 2	15 PSO – 3
CLO-1 :	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-2 :	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-3 :	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-4 :	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-5 :	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-6 :	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-

Duration (hour)		21	21	21	21	21
S-1	SLO-1	*Evolution of Programming& Languages*	*Arithmetic Operators, Relational Operators*	*Basics of functions*	*Array Basic and Types*	*Structures: Initializing Structure, Declaring structure variable*
	SLO-2	*Problem solving through programming*	*Logical Operators, Comma, Conditional operators*	*Function declaration and definition*	*Array Initialization and Declaration*	*Structure using typedef, Accessing members, Nested structure*
S-2	SLO-1	*Creating algorithms*	*Increment Decrement Operators , Bitwise Operators*	*Parameter passing and returning type*	*Accessing, Indexing Array Operations*	*Array of structure* *Accessing elements in a structure array*
	SLO-2	*Drawing flowcharts*	*Assignment Operators and Expressions*	*C main return as integer and void*	*Multi-dimensional array*	*Passing Array of structure to function, Array of pointers to structures*
S-3	SLO-1	*Writing pseudocode*	*Precedence and Order of Evaluation*	*External, Local, Auto and Static storage classes*	*Row/column major formats*	*Self-referral Structures,*
	SLO-2	*Evolution of C language, its usage history*	*Associativity of operators*	*Variable Parameters*	*Command Line Arguments*	*Table look up, Typedef, Unions, Bit-fields*
S 4-7	SLO-1	*Lab 1: Algorithm, Flow Chart, Pseudocode*	*Lab 4: Operators ,Precedence and Associativity, problem solving*	*Lab 7: Practicing Functions and storage classes, Variable Parameters*	*Lab 10: Arrays – Programs using Arrays , 1D, 2D and Multi Dimensional, Command line arguments*	*Lab 13: Structures & Unions*
	SLO-2					
S-8	SLO-1	*Input and output functions: Printf and scanf*	*Statements and Blocks*	*Register Variables*	*Pointers and address operator*	*Files: opening, defining, closing, file access including FILE structure, fopen,*

Duration (hour)		21	21	21	21	21
						fclose
	SLO-2	*Variable Names*	*If-Else-If*	*Scope Rules,*	*Size of Pointer Variable and Pointer Operator*	*File Modes & File Types, stdin, sdtout and stderr*
S-9	SLO-1	*Proper variable naming and Hungarian Notation*	*Nested if, else if*	*Block structure*	*Pointer Declaration and dereferencing pointers*	*Writing contents into a file, Reading file contents- fprintf, fscanf, fwrite, fread*
	SLO-2	*Data Type and Sizes (Little Endian Big Endian)*	*Switch case*	*Initialization, Recursion*	*Pointers and Function Arguments*	*Appending an existing file*
S-10	SLO-1	*Integer floating Point representations*	*Goto , labels*	*Preprocessor directive , Macro*	*Pointers and Arrays*	*File permissions and rights,*
	SLO-2	*Declaration of Variables and Dynamic Initialization of variables*	*Programs on conditional and unconditional branching*	*Standard Library Functions and return types*	*Address Arithmetic*	*Error Handling including exit, perror and error.h, Line I/O, related miscellaneous functions*
S 11-14	SLO-1 SLO-2	*Lab 2: Illustration of Data types, declaration, representations*	*Lab 5: Control flow : Conditional and Unconditional statements*	*Lab 8: Illustration of Scope, register variables, Recursion and STL*	*Lab 11: Functions*	*Lab 14 : make File utility, multi file processing*
S-15	SLO-1	*Constants, Named Constants*	*While loop*	*String Basics*	*Character Pointers and Functions*	*Unix system Interface: File Descriptor,*
	SLO-2	*Type Conversion*	*Do..While loop*	*String Declaration and Initialization*	*Pointer Arrays , Initialization of Pointer Arrays*	*Low level I/O – read and write, Open, create, close and unlink,*
S-16	SLO-1	*Type Modifiers*	*For Loop*	*String Functions: gets(), puts(), getchar(), putchar(), printf()*	*Pointer to Pointer,*	*Random access – lseek*
	SLO-2	*Header Files*	*Break and continue*	*String Functions: atoi, strlen, strcat, strcmp*	*Pointer to functions*	*Discussions on Listing Directory, Storage allocator*
S-17	SLO-1	*Structure of C Program*	*Structured and un- structured programming*	*String Functions: sprint, sscanf, strrev, strcpy, strstr, strtok*	*Complicated declarations and their evaluation*	*Debugging*
	SLO-2	*Compiling and Executing C Programs*	*Programs using looping statements*	*Arithmetic Characters on Strings*	*Practicing Pointers*	*User Defined Header, User Defined Library*
S 18-21	SLO-1 SLO-2	*Lab 3: Simple C Programs*	*Lab 6: Practicing using while, Do, For*	*Lab 9: Programs on Strings and its operations, substring matching*	*Lab 12: Programs using Pointers and arithmetic , Pointer to function*	*Lab 15: User defined header, Unix System interface*

Learning Resources	1. B.W.KernighanandD.M.Ritchi,"TheCProgrammingLanguage",SecondEdition,PHI. 2. B.Gottfried,"ProgramminginC",SecondEdition,SchaumOutlineSeries.	3. Herbert Schildt, "C: The Complete Reference", Fourth Edition, McGrawHill. 4. YashavantKanetkar, "Let Us C",BPBPublications

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Experts From TCS		1. Dr. S.S.Sridhar, SRMIST

Course Code	18LEM101T	Course Name	CONSTITUTION OF INDIA	Course Category	M	Mandatory	L	T	P	C
							1	0	0	0

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	English	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	Utilize the citizen's rights
CLR-2 :	Utilize the basic citizen's fundamental rights of freedom of speech, expression, equality, religion and privacy
CLR-3 :	Identify the Indian constitutional framework with union parliament, government and their functions and citizen's rights
CLR-4 :	Utilize the States functionality and provisions for the betterment of the individual and society
CLR-5 :	Identify the emergency provisions, the functions of election and public service commissions, identify the tax system
CLR-6 :	Utilize the rights of a citizen both individual and as a society by understanding the constitutional provision and rights

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning 1 Level of Thinking (Bloom)	2 Expected Proficiency (%)	3 Expected Attainment (%)	PLO 1 Engineering Knowledge	2 Problem Analysis	3 Design & Development	4 Analysis, Design, Research	5 Modern Tool Usage	6 Society & Culture	7 Environment & Sustainability	8 Ethics	9 Individual & Team Work	10 Communication	11 Project Mgt. & Finance	12 Life Long Learning	13 PSO - 1	14 PSO - 2	15 PSO – 3
CLO-1 :	Identify the basic provisions in the indian constitution	2	80	75	-	-	-	-	-	-	M	H	H	H	-	H	-	-	-
CLO-2 :	List the fundamental rights, rights to equality, freedom, religion, culture, education and the right against exploitation	2	75	70	-	-	-	-	-	-	M	H	H	H	-	H	-	-	-
CLO-3 :	Identify the fundamental duties of the Union of India, President, Vice-President, Union Ministers and Parliament functions	2	80	75	-	-	-	-	-	-	M	H	H	H	M	H	-	-	-
CLO-4 :	Identify the power of states, its legislature, Governors role and the state judiciary	2	75	70	-	-	-	-	-	-	M	H	H	H	M	H	-	-	-
CLO-5 :	List the special provisions and functionality of election commission, public service commission, individual tax and GST	2	85	80	-	-	-	-	-	-	M	H	H	H	H	H	-	-	-
CLO-6 :	Build knowledge on the various aspects in the Indian Constitution, its provisions and right of a citizen and the society	2	85	80	-	-	-	-	-	-	M	H	H	H	M	H	-	-	-

Duration (hour)		6	6	6	6	6
S-1	SLO-1	Meaning of the constitution law and constitutionalism	The Directive Principles of State Policy	President of India (with Powers and Functions)	Governor of the State (with Powers and Functions)	Local Self Government – Constitutional Scheme in India
	SLO-2	Historical perspective of the Constitution of India	Scheme of the Fundamental Right to Equality	Prime Minister of India (with Powers and Functions)	The Chief Minister of the State (with Powers and Functions)	Emergency Provisions : National, President Rule, Financial Emergency
S-2	SLO-1	Salient features and characteristics of the Constitution of India	Scheme of the Fundamental Right to certain Freedom under Article 19	Union Judiciary (Supreme Court) Jurisdiction of the Supreme Court	State Judiciary (High Courts)	Election Commission of India (with Powers and Functions)
	SLO-2	Citizenship	Scope of the Right to Life and Personal Liberty under Article 21	State Government	Union Territories, Panchayats,	The Union Public Service Commission (with Powers and Functions)
S-3	SLO-1	Scheme of the fundamental rights	Union Government, Union Legislature (Parliament)	State Legislature, Legislative Assembly, Legislative Council	Municipalities, Scheduled and Tribal Areas	Amendment of the Constitutional Powers and Procedure
	SLO-2	The scheme of the Fundamental Duties and its legal status	Lok Sabha and Rajya Sabha (with Powers and Functions), Union Executive	Powers and Functions of the State Legislature, State Executive	Co-operative Societies	Income Tax, Goods and Services Tax

Learning Resources	1. DurgadasBasu, Introduction to the Constitution of India,Lexis- Nexis, 2015 2. Subash C Kashyap, Our Parliament, National Books Trust, 2011	3. Kaushal Kumar Agarwal, India's No 1 book on Tax : Simple Language Advanced Problems: Income Tax, Kindle, 2017 4. Vivek K R Agarwal, GST Guide for students: Making GST – Good and Simple Tax, Neelam Book House, 2017

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (100% weightage)								Final Examination	
		CLA – 1 (20%)		CLA – 2 (30%)		CLA – 3 (30%)		CLA – 4 (20%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*40%*	-	*30%*	-	*30%*	-	*30%*	-	-	-
	Understand										
Level 2	Apply	*40%*	-	*40%*	-	*40%*	-	*40%*	-	-	-
	Analyze										
Level 3	Evaluate	*20%*	-	*30%*	-	*30%*	-	*30%*	-	-	-
	Create										
	Total	100 %		100 %		100 %		100 %		-	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers				
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts		
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2. Mr. Durga Prasad Bokka, TCS Chennai, durgaprasad@tcs.com	2. Ms. Subashree, VIT, Chennai, subashree@vit.ac.in	2. Ms. Cauveri B, SRMIST	4. Dr. M. M.Umamaheswari, SRMIST	

Course Code	18GNM101L	Course Name	PHYSICAL AND MENTAL HEALTH USING YOGA	Course Category	M	Mandatory	L	T	P	C
							0	0	2	0

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Centre for Applied Research in Education	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	Utilize rich Indian heritage and knowledge for self-healing and self-protection from diseases
CLR-2 :	Apply meditation for attaining happiness and balancing emotions and state of mind and body
CLR-3 :	Intellectually develop oneself by identifying oneness with divine state and transform towards absolute oneness in space
CLR-4 :	Socially transform into a meaningful and purposeful individual to both self and society
CLR-5 :	Spiritually enlighten oneself by purifying the body, soul and have a blissful existence
CLR-6 :	Achieve personal benefits of whole health and wellbeing by practicing yoga for physical, emotional and mental fitness

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning 1 Level of Thinking	Learning 2 Expected Proficiency (%)	Learning 3 Expected Attainment (%)	PLO 1 Engineering Knowledge	PLO 2 Problem Analysis	PLO 3 Design & Development	PLO 4 Analysis, Design, Research	PLO 5 Modern Tool Usage	PLO 6 Society & Culture	PLO 7 Environment & Sustainability	PLO 8 Ethics	PLO 9 Individual & Team Work	PLO 10 Communication	PLO 11 Project Mgt. & Finance	PLO 12 Life Long Learning	PLO 13 PSO - 1	PLO 14 PSO - 2	PLO 15 PSO – 3
CLO-1 :	Identify Indian heritage, culture. Identify key anatomical structures in the human body and basic exercises for the same	2	80	75	-	M	-	-	-	H	H	H	H	H	-	H	-	-	-
CLO-2 :	Apply yoga meditation practices for emotional development and wellbeing	2	75	70	-	M	-	-	-	H	H	H	H	H	-	H	-	-	-
CLO-3 :	Identify educational and intellectual development methods using five sense realization and transformation	3	80	75	-	M	-	-	-	H	H	H	H	H	-	H	-	-	-
CLO-4 :	Demonstrate human values and emotions through thorough understanding about life, naturopathy and food habits	3	75	70	-	M	-	-	-	H	H	H	H	H	-	H	-	-	-
CLO-5 :	Impact self and society by peaceful coexistence with self-introspection and balanced diet charts	3	85	80	-	M	-	-	-	H	H	H	H	H	-	H	-	-	-
CLO-6 :	Demonstrate yoga exercises and postures to stretch and strengthen the body and mind	3	85	80	-	M	-	-	-	H	H	H	H	H	-	H	-	-	-

Duration (hour)		Physical Development	Emotional Development	Intellectual Development	Social Development	Spiritual Development
		6	6	6	6	6
S-1	SLO-1	Indian Heritage & Culture, Concept of Yoga, Objectives, Science & Art of Yoga	Brain Functions, Bio-Magnetism, Cognitive Mind	Education & Intelligence Development using Yoga. Improving Intelligence	Introduction: Social Intelligence	Spiritual Connect & Yoga: Self-Realization, Self-Awareness, Self-Actualization
	SLO-2	Women and Yoga Practice – Classification, Modern Age, Philosophy of Life	Emotional Intelligences, Managing Stress and Emotions	Learnability through Concentration, Intelligence through learning sense organs	Human values, Ethics & Morality	Cause and Effect Realization (Karma Yoga), Harmony in Life
S-2	SLO-1	Practice1: Standing exercise, Surya Namaskar	Practice4: Surya Namaskar, Standing asanas	Practice7: Yoga for Youthfulness (Kayakalpah Yoga)	Practice10: Kayakalpha, Bhandas, Meditation (Crown)	Practice13: Management of Physical problems (Yoga therapy)
	SLO-2	Meditation (Self Realization), Relaxation	Meditation (Five Sense Realization), Relaxation	Meditation (Five Sense Realization), Relaxation	Self-introspection Practice (Moralization of Desire) & Relaxation	Meditation (Nine centre) & Relaxation
S-3	SLO-1	Physical Health: Body Structure, Diseases and Causes, Science of Human Body	Meditation for Emotional development: Eyebrow Center (Agna) Meditation	Theory of Intellectual Transformation: Divine state origin, absolute space,	Exercises for Self-Introspection: Analysis of thoughts, Moralization of desires	Spiritual Enlightenment
	SLO-2	Yoga &Youthfulness. Benefits, Comparison between other exercises and Yoga	Genetic Centre (Santhi) Meditation. Stress Relaxation Exercises	Transformation of universe, living beings, Intelligence, Knowledge, Wisdom & Peace	Anger Management, Eradicating worries, concerns & challenges	Purifying the Body (Genetic center)
S-4	SLO-1	Practice2: Surya Namaskar, Sitting Exercises	Practice5: Surya Namaskar, Sitting asanas,	Practice8: Kayakalpha Yoga, Pranayama	Practice11: Kayakalpha Yoga, Krisya Yoga	Practice14: Project Submission
	SLO-2	Meditation (Self Realization) – Relaxation	Meditation (Agna) & Relaxation	Meditation (Agna) - Relaxation	Yoga Mudhras, Meditation (Santhi) & Relaxation	Meditation, Introspection, Sublimination

Duration (hour)		Physical Development	Emotional Development	Intellectual Development	Social Development	Spiritual Development
		6	6	6	6	6
S-5	SLO-1	Exercises: Hands, Legs, Neuro-Muscular breathing, Eye, Ears, Nostrils, kidney, brain	Asanas (Postures) for Body Structure: Full Body Structure Maintenance	Exercises: Intellectual development Brain Crown Centre (Thuriyam) Meditation	Therapy for Social Development: Gestures Yoga (Mudhras) – Body locks (Bhandhas)	Spirituality for Stress Management
	SLO-2	digestive tract, stomach, lungs, spine, hip, neck. Pressure points in our body	Standing, Sitting, Prone & Supine Posture, Benefits of asanas	Five Senses (Panchendriya) Meditation, Consciousness and Law of nature	Indian Medical System: Naturopathy, Food, Nutrition, Diet Chart for Youthfulness	Yoga Practices for blissful existence
S-6	SLO-1	Practice3: Prone & Supine posture Exercises	Practice6: Surya Namaskar, Prone & Supine posture Asanas	Practice9: Kayakalpha, Mudhras, Self-introspection Practice (Thought Analysis)	Practice12: Balancing Asanas,	Practice15: Practical Exam
	SLO-2	Meditation (Self Realization) – Relaxation	Meditation (Shanthi) & Relaxation	Meditation (Santhi), & Relaxation	Meditation (Crown) & Relaxation	Meditation & Relaxation

Learning Resources	1. SadhguruJaggiVasudev, Inner Engineering – A yogi's guide to joy, 2016 2. Shri Shri Ravi Shankar, The Art of stress-free Living, 2011 3. Swami Ramdev Ji Yog Its Philosophy and Practice, 2008 4. YogirajVethathiri Maharishi, Yoga for Modern Age, Tenth edition, Vethathiri Publications, 2007 5. YogirajVethathiri Maharishi, Simplified Physical Exercises, Forty Second edition, Jan-2014	6. Vivekananda KenthriaPrkasan Trust, Yogam, 2006 7. Swami Chetanananda, Meditation and Its Methods According to Swami Vivekananda, Jan 2001 8. Dr.Lakshminarain Sharma, Yoga for the cure of Common Diseases, Mar 2016 9. Swami SatyanandaSaraswati, Asana Pranayama Mudra Bandha, Bihar School of Yoga, 1993 10. Dr. Asana Andiappan, Thirumoolar'sAstanga Yoga, International Yoga Academy, 2017

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (100% weightage)								Final Examination	
		CLA – 1 (20%)		CLA – 2 (30%)		CLA – 3 (30%)		CLA – 4 (20%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	-	40%	-	30%	-	30%	-	30%	-	-
Level 2	Apply Analyze	-	40%	-	40%	-	40%	-	40%	-	-
Level 3	Evaluate Create	-	20%	-	30%	-	30%	-	30%	-	-
	Total	100 %		100 %		100 %		100 %		-	

 # CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
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2. Mrs. R. Piramukutty, World Community Service Centre, piramukutty.gdvmvkm@gmail.com	2.Dr.N.Perumal, Vethathiri Maharishi Institute for Spiritual and Intuitional Education, visionacademy@vethathiri.edu.in	2. Dr. S. JahiraParveen SRMIST

Course Code	18PDM101L	Course Name	PROFESSIONAL SKILLS AND PRACTICES	Course Category	M	Mandatory	L	T	P	C
							0	0	2	0

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Career Development Centre	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	Utilize success habits to improve achievement in life
CLR-2 :	Develop inter personal skills and be an effective goal oriented team player to achieve success
CLR-3 :	Utilize professionalism with idealistic, practical and moral values that govern the behavior
CLR-4 :	Become an expert in communication and problem solving skills
CLR-5 :	Re-engineer attitude required to succeed and understand its influence on behavior to achieve professionalism
CLR-6 :	Enhance holistic development of students and improve their employability skills

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	Engineering	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Identify success habits	2	80	75	-	-	-	-	-	-	H	H	H	H	-	H	-	-	-
CLO-2 :	Acquire inter personal skills and be an effective goal oriented team player	2	75	70	-	-	-	-	-	-	H	H	H	H	-	H	-	-	-
CLO-3 :	Develop professionalism with idealistic, practical and moral values	2	80	75	-	-	-	-	-	-	H	H	H	H	-	H	-	-	-
CLO-4 :	Acquire communication and problem solving skills.	2	75	70	-	-	-	-	-	-	H	H	H	H	-	H	-	-	-
CLO-5 :	Re-engineer their attitude and understand its influence on behavior	2	85	80	-	-	-	-	-	-	H	H	H	H	-	H	-	-	-
CLO-6 :	Apply behavior changing elements to construct professionalism in character and behavior	2	85	80	-	-	-	-	-	-	H	H	H	H	-	H	-	-	-

Duration (hour)		6	6	6	6	6
S-1	SLO-1	Personality profiling	Etiquette and Grooming	Surveying and Reporting	Profile building	Innovation
	SLO-2	Being Proactive	Etiquette and Grooming	Surveying and Reporting	Profile building	Innovation
S-2	SLO-1	Begin with the end in mind	Collaborative skills	Projects	Personal Branding	Innovation
	SLO-2	Putting first things first	Collaborative skills	Projects	Personal Branding	Innovation
S-3	SLO-1	Thinking Win-Win	Networking skills	Paper presentations	Personal Branding	Creativity and out of box thinking
	SLO-2	Seeking first to understand and then to be understood	Networking skills	Paper presentations	Personal Branding	Creativity and out of box thinking
S-4	SLO-1	Synergizing	Team work and Support	Introduction to design thinking	USP	Creativity and out of box thinking
	SLO-2	Sharpening the saw	Team work and Support	Introduction to design thinking	USP	Creativity and out of box thinking
S-5	SLO-1	Character building	Leadership Skills	Generate ideas that are potential solutions to the problem identified	Developing profile	Six thinking hats
	SLO-2	IKIGAI	Leadership Skills	Generate ideas that are potential solutions to the problem identified	Developing profile	Six thinking hats
S-6	SLO-1	Self-worth	Leadership Styles	Report writing	Developing profile	Six thinking hats
	SLO-2	Attitude	Leadership Styles	Report writing	Developing profile	Six thinking hats

Learning Resources	*1. Charles Harrington Elstor, Covey Sean, Seven Habits of Highly Effective Teens, New York, Fireside Publishers, 1998*	*2. Thomas A Harris, I am ok, You are ok, New York-Harper and Row, 1972* *3. Carol Dweck, Mindset, The New Psychology of Success, Random House Pub. 2006*

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (100% weightage)								Final Examination	
		CLA – 1 (20%)		CLA – 2 (30%)		CLA – 3 (30%)		CLA – 4 (20%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	-	*40%*	-	*30%*	-	*30%*	-	*30%*	-	-
	Understand										
Level 2	Apply	-	*40%*	-	*40%*	-	*40%*	-	*40%*	-	-
	Analyze										
Level 3	Evaluate	-	*20%*	-	*30%*	-	*30%*	-	*30%*	-	-
	Create										
	Total	100 %		100 %		100 %		100 %		-	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts	
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SEMESTER - II

Course Code	18MBH162T	Course Name	BUSINESS COMMUNICATION & VALUE SCIENCE - II	Course Category	H	Humanities and Social Sciences	L	T	P	C
							2	0	0	2

Pre-requisite Courses	Basic Knowledge of English (verbal and written) Completion of all units from Semester 1	Co-requisite Courses	NA	Progressive Courses	NA
Course Offering Department	MBA	Data Book / Codes/Standards			

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	Develop effective writing, reading, presentation and group discussion skills.
CLR-2 :	Help students identify personality traits and evolve as a better team player.
CLR-3 :	Introduce them to key concepts of Morality and Behavior and beliefs
CLR-4 :	Introduce them to the key concepts of diversity and inclusion
CLR-5 :	Understand the concept of speed reading
CLR-6 :	Identify the individual personality types

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning 1 Level of Thinking (Bloom)	Learning 2 Expected Proficiency (%)	Learning 3 Expected Attainment (%)	PLO 1 Engineering Knowledge	PLO 2 Problem Analysis	PLO 3 Design & Development	PLO 4 Analysis, Design, Research	PLO 5 Modern Tool Usage	PLO 6 Society & Culture	PLO 7 Environment & Sustainability	PLO 8 Ethics	PLO 9 Individual & Team Work	PLO 10 Communication	PLO 11 Project Mgt. & Finance	PLO 12 Life Long Learning	PLO 13 PSO - 1	PLO 14 PSO - 2	PLO 15 PSO – 3
CLO-1 :	Understand tools of structured written communication	2	60	50	*H*	*H*	*H*	*M*	*M*	*L*	*M*	*M*	*L*	*M*	*H*	*L*	*H*	*H*	*H*
CLO-2 :	Understand the basics of presentation	2	80	70	*H*	*H*	*L*	*L*	*M*	*M*	*M*	*L*	*L*	*M*	*H*	*H*	*H*	*H*	*L*
CLO-3 :	Apply the basic concept of speed reading, skimming and scanning.	1	80	75	*H*	*H*	*L*	*L*	*M*	*M*	*L*	*L*	*L*	*M*	*H*	*M*	*H*	*H*	*L*
CLO-4 :	Identify individual personality types and role in a team.	2	80	70	*H*	*H*	*M*	*L*	*M*	*M*	*L*	*L*	*L*	*M*	*H*	*H*	*H*	*H*	*M*
CLO-5 :	Recognize the concepts of outward behavior and internal behavior	3	90	80		*H*	*H*	*L*	*M*	*M*	*L*	*L*	*L*	*M*	*H*	*L*		*H*	*H*
CLO-6 :	Gain Knowledge in application of the various techniques of communication	3	90	80	H	H	H	M	H	M	H	M	L	H	M	H	H	H	H

Duration (hour)		6	6	6	6	6
S-1	SLO-1	Icebreaker. 1) Participate in Join Hands Movement of .Individual identification of social issues. 2)Each Individual chooses One particular social issue which the ywould like to address. 3)Class to be divided in teams for the entire semester. All activities to be done in teams and the grades, credit Points will be captured in the leader board in the class room. 4)Theory to introduce the participant Slam book to be used for capturing Individual learning points and observations. Group discussion, Practical	Each group will form an NGO. Create Vision, Mission, Value statement, tagline and Design a logo. Practical (practical)	Design a skit- a) write the script articulating the message of their respective NGOs. Read out the script. (Skit time- 5 minutes). Feedback of Theory. Practical based Learning Formative Evaluation	Touch the target (Blind man) - Debriefing of the Practical. Film: "The fish and I' 'by BabakHabibifar" (1.37mins). Practical and Discussion	Prepare and publish the final episode of the E Magazine. Practical
	SLO-2	Research on the social cause each group will work for. Practical (practical)	Introduction to basic presentation skills & ORAI app Theory and video	Promote the play through asocial media and gather your audience. Enact the play. Capture the numbers of likes and reviews.	Groups to create a story – 10 minutes of a person's life affected by the social issue groups are working on .Narrate	SATORI –Participants share the personal takes way acquired from working in teams, GD, learning about presentations and understanding diversity inclusion.

Duration (hour)		6	6	6	6	6
				Theory to assign grades to individual team.(Lab Time) Practical based learning Formative Evaluation	the story in first person. Feedbacks to be shared by the other groups. Practical, sharing and Practical	Discussion
S-2	SLO-1	Class discussion- Good and Bad Writing. Common errors punctuation rules, use of words. PPT, Theory and Practical	Groups to present their NGOs. Apply the learning gathered from session 2. Presentation to be recorded by the groups. feedback from the audience/ Professor Formative evaluation	Promote the play through asocial media and gather your audience. Enact the play. Capture the numbers of likes and reviews. Theory to assign grades to individual team.(Class Time) Practical based learning Formative Evaluation	Groups to create a story – 10 minutes of a person's life affected by the social issue groups are working on. Narrate the story in first person. Feedbacks to be shared by the other groups. (Part 2) Practical, sharing and Practical	Revisit your resume Include your recent achievements in your resume. Submit it to the Professor
	SLO-2	Group Practical- As a group, they will work on the social issue identified by them. Research, read and generate a report based on the findings. (Apply the learning and recap from the session) Formative evaluation	Group to come back and share their findings from there cording. Post work- individual write up to be written and evaluated for the E- magazine Sharing of learning, written Practical and formative evaluation	(1) Theory to find out from the participants their Views, observations and experiences of working in a team(2) Intro of Dr. Meredith Belbin and his research on team work and how individuals contribute. Discussion and Theory	Research on a book, incident or film based on the topic of your respective NGO Research and written Practical	Quiz Time Summative Evaluation for Unit
S-3	SLO-1	Practical: Plan and design an EMagazine. Apply and assimilate the knowledge gathered from Sem-1 till date. Share objective & guideline. All members to contribute an article to the magazine, trainer to evaluate the content. Practical (Practical)	Group to come back and share their findings from the recording. Post work-individual write up to be written and evaluated for the E- magazine (Part 2). *Sharing of learning, written Practical and formative evaluation*	Cont. (3) Belbin's 8 TeamRoles and Lindgren's Big 5personality traits.(4) Belbin's 8team player styles. Practical based learning followed by a presentation	Research on a book, incident or film based on the topic of your respective NGO(Part2). Research and written Practical	Project- 1) Each team to look for an NGO/ social group in the city which is working on the issue their college group is supporting. 2)Spend a day with the NGO/ social group to understand exactly how they work and the challenges they face. 3)Render voluntary service to the group for one day Invite the NGO/ social group to address their university students for couple of hours. Plan the suitable venue in the university, gather audience, invite faculty members etc.(they need to get their plan ratified their professor). Outcome-Host an interactive session with the NGO spokesperson 4)The groups to present their experience of a day with the NGO and inspire students to work for the cause. (A). Field work: Formative Evaluation
	SLO-2	*Practical: Plan and design an EMagazine. Apply and assimilate the knowledge egathered from Sem-1 till date. Share objective & guideline.*	Prepare and publish the Second episode of the EMagazine. Practical (Lab)	(1) Team Falcon Practical to identify individual personality traits with Belbin's 8 team player styles	Write a review in a blog on the topics they are covering in their research. Theory will give grades to each team.	Project- 1) Each team to look for an NGO/ social group in the city which is working on the issue their college group is supporting. 2)Spend a day with the NGO/ social group to

Duration (hour)		6	6	6	6	6
		All members to contribute an article to the magazine, trainer to evaluate the content. (Part 2) Practical (Practical)		Practical based learning followed by a presentation.	Written Practical and Formative Evaluation	understand exactly how they work and the challenges they face. 3) Render voluntary service to the group for one day 4) Invite the NGO/ social group to address their university students for couple of hours. Plan the suitable venue in the university, gather audience, invite faculty members etc.(they need to get their plan ratified their professor). Outcome-- Host an interactive session with the NGO spokesperson 5) The groups to present their experience of a day with the NGO and inspire students to work for the cause.(B) **Field work: Formative Evaluation**
S-4	SLO-1	Lucid Writing: Encourage the students to go through the links given about Catherine Morris and Joanie Mcmahon's writing techniques. Theory and Discussion	Prepare and publish the Second episode of the EMagazine. (Part 2). Practical (Lab)	(2) Similar personality types to form groups (3) Groups present their traits. Presentation	Session on Diversity &Inclusion- Different forms of Diversity in our society. PPT, Theory, discussion	Project- 1) Each team to look for an NGO/ social group in the city which is working on the issue their college group is supporting. 2) Spend a day with the NGO/ social group to understand exactly how they work and the challenges they face. 3) Render voluntary service to the group for one day 4) Invite the NGO/ social group to address their university students for couple of hours. Plan the suitable venue in the university, gather audience, invite faculty members etc.(they need to get their plan ratified their professor). Outcome-- Host an interactive session with the NGO spokesperson 5) The groups to present their experience of a day with the NGO and inspire students to work for the cause.(C). Field work: Formative Evaluation
	SLO-2	Create the magazine Practical (Lab)	Speed Reading session: Introduction to skimming and scanning; practice the same. Theory and Practical	Prepare and publish the third episode of the EMagazine. Practical	Teams to video record interviews of people from diverse groups (Ask 5 questions). Share the recordings in FB Practical	Project- 1) Each team to look for an NGO/ social group in the city which is working on the issue their college group is supporting. 2) Spend a day with the NGO/ social group to understand exactly how they work and the challenges they face. 3) Render voluntary service to the group for one day 4) Invite the NGO/ social group to address their university students for couple of hours. Plan the

Duration (hour)		6	6	6	6	6
						suitable venue in the university, gather audience, invite faculty members etc.(they need to get their plan ratified their professor). Outcome—Host an interactive session with the NGO spokesperson The groups to present their experience of a day with the NGO and inspire students to work for the cause.(D) Field work: Formative Evaluation
S-5	SLO-1	SATORI – Participants share the personal take away acquired from GD, writing and reading skills activities captured in their handbook. Share the most Important learning points from the activities done so far and how that learning has brought a change. Theory/Discussion	SATORI – Join the dots- Participants to connect their learning gathered from AIPUnit-2 with their Existing curriculum. Share the most important learning points	SATORI – (join the dots with participants personal life)Participants share the personal take away acquired from working in teams, GD, learning about Presentations, presenting their NGOs. Share the most important learning points from the activities done so far. Participants talk about the Changes they perceive in themselves	Teams to video record interviews of people from diverse groups (Ask 5 questions). Share the recordings in FB(Part b). Practical	Project- 1) Each team to look for an NGO/ social group in the city which is working on the issue their college group is supporting. 2) Spend a day with the NGO/ social group to understand exactly. How they work and the challenges they face. 3) Render voluntary service to the group for one day 4) Invite the NGO/ social group to address their university students for couple of hours. Plan the suitable venue in the university, gather audience, invite faculty members etc.(they need to get their Plan ratified their professor). Outcome--Hostan interactive session with the NGO spokesperson 5) The groups to present their experience of a day with the NGO and inspire students to work for The cause. (E). Field work: Formative Evaluation
	SLO-2	Launching an E Magazine. Practical (Lab)	Quiz Time Summative Evaluation for Unit	Quiz Time Summative Evaluation for Unit	Debate on the topic of diversity with an angle of ethics, morality and Respect for individual(In the Presence of an external moderator).Groups will be graded By The professor. Practical and formative evaluation	Project- 1) Each team to look for an NGO/ social group in the city which Is working on the issue their college group is supporting. 2) Spend a day with the NGO/ social group to understand exactly How they work and the challenges they face. 3) Render voluntary service to the group for one day 4) Invite the NGO/ social group to address their university students for couple of hours. Plan the suitable venue in the university, gather audience, invite faculty members etc.(they need to get their Plan ratified their professor). Outcome--Hostan interactive session with the NGO spokesperson

Duration (hour)		6	6	6	6	6
						5) The groups to present their experience of a day with the NGO and inspire students to work for the cause.(F) Field work: Formative Evaluation
S-6	SLO-1	Launching an E Magazine. (Part 2). Practical (Lab)	Ad campaign-Brain Storming session- Students to Discuss and explore the means of articulating and amplifying the social issue their NGO are working for. Discussion	Ten minutes of your time – a short film on diversity. Play the video.(Link to be attached in the FG). Video & discussion	Prepared speech- Every student will narrate the challenges faced by a Member of a diverse group in 4minutes (speech in first person).Theory to give feedback to each student.. Practical and formative evaluation	Project- 1) Each team to look for an NGO/ social group in the city which Is working on the issue their college group is supporting. 2) Spend a day with the NGO/ social group to understand exactly How they work and the challenges they face. 3) Render voluntary service to the group for one day 4) Invite the NGO/ social group to address their university students for couple of hours. Plan the suitable venue in the university, gather audience, invite faculty members etc.(they need to get their Plan ratified their professor). Outcome--Hostan interactive session with the NGO spokesperson 5) The groups to present their experience of a day with the NGO and inspire students to work for the Cause (G). Field work: Formative Evaluation
	SLO-2	Quiz Time Summative Evaluation for Unit	Design a skit- a) write the script articulating the message of their Respective NGOs. Read out the script. (Skit time-5 minutes). Feedback of Theory. Practical based learning. Formative evaluation by Theory	Discuss key take away of the film. Theory to connect the key takeaway of the film to the concept of empathy. Practical	Discussion on TCS values, Respect for Individual and Integrity. PPT, Theory ,Practical and discussion	Project- 1) Each team to look for an NGO/ social group in the city which Is working on the issue their college group is supporting. 2) Spend a day with the NGO/ social group to understand exactly How they work and the challenges they face. 3) Render voluntary service to the group for one day 4) Invite the NGO/ social group to address their university students for couple of hours. Plan the suitable venue in the university, gather audience, invite faculty members etc.(they need to get their Plan ratified their professor). Outcome-Host an interactive session with the NGO spokesperson 5) The groups to present their experience of a day with the NGO and inspire students to work for the cause. (H) Field work: Formative Evaluation

Learning Resources	1. Guiding Souls : Dialogues on the purpose of life; Dr. A.P.J Abdul Kalam ;Publishing Year-2005; Co-author--ArunTiwari 2. The Family and the Nation; Dr. A.P.J Abdul Kalam; Publishing year: 2015; Co-author: AcharyaMahapragya.	3. The Scientific India: A twenty First Century Guide to the World around Us; Dr. A.P.J Abdul Kalam; Publishing year: 2011; Co-author-Y.S.Rajan 4. ForgeYour Future: Candid, Forthright,Inspiring;Dr.A.P.JAbdulKalam;Publishingyear:2014.

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%	-	30%	-	30%	-	40%	-	30%	-
	Understand										
Level 2	Apply	40%	-	40%	-	40%	-	30%	-	40%	-
	Analyze										
Level 3	Evaluate	30%	-	30%	-	30%	-	30%	-	30%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Experts From TCS	Dr.K.Latha, Chandasekara University, Kanchipuram	Mr.Vijay Raja, Assistant Professor, SRMSOM
	Dr.Thenmozhi, Professor, University of Madras	Dr.SanthoshKumart, Head – Human Resources , SRMSOM

Course Code	18MBH163T	Course Name	FUNDAMENTALS OF ECONOMICS	Course Category	H	Humanities & Social Sciences	L	T	P	C
							2	0	0	2

Pre-requisite Courses	*Nil*	Co-requisite Courses	*Nil*	Progressive Courses	*Nil*
Course Offering Department	*School of Management*	Data Book / Codes/Standards		*Nil*	

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*
CLR-1 :	*To provide a brief understanding of basic principles in economics*
CLR-2 :	*Understand the concepts of demand and supply analysis*
CLR-3 :	*Acquire knowledge on the principles of costs and other concepts of production*
CLR-4 :	*Understand market structures*
CLR-5 :	*Introduction to macro economics*
CLR-6 :	*Knowledge of various concepts of micro and macro economics in real time economy*

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	**Learning**			**Program Learning Outcomes (PLO)**														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	*Able to assess and understand the firm and the industry basic framework*	*2*	*80*	*70*	*H*	*H*	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-2 :	*Able to gauge and incorporate consumers behavior in decision making by the firm and consumers*	*2*	*85*	*75*	*H*	*H*	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-3 :	*Able to understand production decisions*	*2*	*75*	*70*	*H*	-			-	-	-	-	-	-	-	-	-	-	-
CLO-4 :	*Able to understand and assess decisions of an economy and its working*	*2*	*85*	*80*	*H*	*H*	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-5 :	*Able to understand the relationship between world economy and Indian economy*	*2*	*85*	*75*	*H*	-	*H*	-	-	-	-	-	-	-	-	-	-	-	-
CLO-6 :	*Able to understand the relationship between world economy and Indian economy*	*2*	*80*	*70*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Duration (hour)		**6**	**6**	**6**	**6**	**6**
S-1	SLO-1	*Introduction- Firm and industry- Micro economics*	*Utility Maximization and Consumption*	Production Function	*Macro economics-Introduction*	*External sector*
	SLO-2	*Meaning and scope of economics*	*Consumers' and Producers' Surplus*	Iso-quants	*Aggregate demand*	Exports and Imports
S-2	SLO-1	*Importance of study of economics*	*Price Ceilings and Price Floors; Consumer Behaviour*	Isocosts	*Aggregate supply*	*Money* —Definitions; *Demand for Money*
	SLO-2	*Functions of economics*	*Axioms of Choice*	Producer equilibrium	*Circular flow of income*	Transactionary and Speculative Demand
S-3	SLO-1	*Demand - Introduction*	*Budget Constraints and Indifference Curves*	Cost Minimization	*National Income and its Components*	*Supply of Money*
	SLO-2	*Theory of demand*	*Consumer's Equilibrium*	Cost Curves — Total, Average and Marginal Costs	GNP, NNP, GDP, NDP	Bank's Credit Creation Multiplier
S-4	SLO-1	*Shifting and Expansion of demand*	*Income and Substitution Effects*	Long Run and Short Run Costs	Consumption Function	*Integrating Money and Commodity Markets*
	SLO-2	*Elasticity of demand*	*Derivation of a Demand Curve;*	Equilibrium of a Firm Under Perfect Competition	Investment	IS,LM Model
S-5	SLO-1	*Theory of supply*	*Applications — Tax and Subsidies*	Equilibrium of a Firm Under Monopoly	*Simple Keynesian Model of Income Determination*	*Business Cycles and Stabilization* — Monetary and Fiscal Policy

Duration (hour)		6	6	6	6	6
	SLO-2	*Market equilibrium*	*Intertemporal Consumption*	Equilibrium of a Firm Under Monopolistic Competition	*Keynesian Multiplier*	Central Bank and the Government; *The Classical Paradigm*
S-6	SLO-1	*Price and output-Firm*	*Suppliers' Income Effect*	*Pricing decisions under various market structures*	*Government Sector*	Price and Wage Rigidities
	SLO-2	*Price and output - Industry*	*Decision making*	*Implications of pricing decisions*	Taxes and Subsidies	Voluntary and Involuntary Unemployment

Learning Resources	1. *Microeconomics*, Pindyck, Robert S., and Daniel L. Rubinfeld 2. *Macroeconomics*, Dornbusch, Fischer and Startz. 3. *Economics*, Paul Anthony Samuelson, William D. Nordhaus.	4. *Intermediate Microeconomics: A Modern Approach*, Hal R, Varian 5. *Principles of Macroeconomics*, N. Gregory Mankiw.

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%	-	30%	-	30%	-	40%	-	30%	-
	Understand										
Level 2	Apply	40%	-	40%	-	40%	-	30%	-	40%	-
	Analyze										
Level 3	Evaluate	30%	-	30%	-	30%	-	30%	-	30%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Experts From TCS		*Dr. Nisha Ashokan*
		Dr. Padmaja M

Course Code	18MAB163T	Course Name	LINEAR ALGEBRA	Course Category	B	Basic Sciences	L	T	P	C
							3	1	0	4

Pre-requisite Courses	18MAB161T	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	Apply basic concepts of Matrix method to solve linear equations.			
CLR-2 :	Apply analytical concepts and numerical methods of Matrix to solve linear equations.			
CLR-3 :	Apply Vector space and its properties like Dimension, Basis, orthogonality, Projections, Gram-Schmidt orthogonalization and QR decomposition to solve engineering related problems.			
CLR-4 :	Apply Eigen values and Eigenvectors, Positive definite matrices, Linear transformations, Hermitian matrices and unitary matrices tosolve engineering related problems.			
CLR-5 :	Understand the concepts of Singular value decomposition and Principal component analysis on basic applications in Image Processing and Machine Learning.			
CLR-6 :	Utilize the concepts in Linear Algebra for the understanding of Engineering and Technology.			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Gaining knowledge in basic concepts of Matrix method to solve linear equations.	2	85	80	M	H	L						M	L		H			
CLO-2 :	Gaining knowledge in analytical concepts and numerical methods of Matrix to solve linear equations.	2	85	80	M	H		M	M				M			H			
CLO-3 :	Understanding the concepts of vector space and its properties related to engineering problems.	2	85	80	M	H							M			H			
CLO-4 :	Understanding the concepts of linear equations obtained from real world problems based on the characteristics of matrix.	2	85	80	M	H		M					M			H			
CLO-5 :	Knowing and comprehend the machine learning methods on simple model of image process by the concepts of Singular value decomposition and Principal component analysis.	2	85	80	M	H	L						M	L		H			
CLO-6 :	Apply the basic concepts of Linear Algebra to understand how to create a mathematical simulations for any real world problems.	2	85	80	M	H	L						M	L		H			

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		12	12	12	12	12
S-1	SLO-1	Introduction to Matrices	Basic definitions of vectors	Introduction to vector space	Introduction to Eigen values and corresponding Eigen vectors	Introduction to Singular value decomposition
	SLO-2	Problems on Matrices	Examples of vectors	Examples of vector space	Simple problems on Eigen values and corresponding Eigen vectors	Examples of Singular value decomposition
S-2	SLO-1	Problems on Matrices	Formation of linear combinations	Definition of dimension of vector space	Problems on Eigen values and corresponding Eigen vectors	Introduction to Principal component analysis
	SLO-2	Problems on Matrices	Examples of linear combinations	Definition of basis of vector space	Problems on Eigen values and corresponding Eigen vectors	Examples of Principal component analysis
S-3	SLO-1	Introduction to Determinants	Introduction to Rank of matrix	Problems ondimension and basis of vector space	Problems on Eigen values and corresponding Eigen vectors	Simple problems on singular value and principle of decomposition
	SLO-2	Problems on Determinants	Problems on Rank of matrix	Problems on dimension and basis of vector space	Problems on Eigen values and corresponding Eigen vectors	Simple problems on singular value and principle of decomposition

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		12	12	12	12	12
S-4	SLO-1	*Problem solving using tutorial sheet 1 in Matrices*	*Problem solving using tutorial sheet 4 in rank of matrix*	*Problem solving using tutorial sheet 7 on dimension and basis of vector space*	*Problem solving using tutorial sheet 10 in finding Eigen values and corresponding Eigen vectors*	*Problem solving using tutorial sheet 13*
	SLO-2	*Problem solving using tutorial sheet 1 in determinants*	*Problem solving using tutorial sheet 4 in rank of matrix*	*Problem solving using tutorial sheet 7 on dimension and basis of vector space*	*Problem solving using tutorial sheet 10 in finding Eigen values and corresponding Eigen vectors*	*Problem solving using tutorial sheet 13*
S-5	SLO-1	*Solution of Linear Equations*	*Definition of Gaussian elimination*	*Definition of Orthogonality with simple examples*	*Definition of Positive definite matrices.*	*Introduction to Image Processing*
	SLO-2	*Solution of Linear Equations*	*Problems using Gaussian elimination*	*Definition of Projections with simple examples*	*Examples of Positive definite matrices.*	*Examples on Image Processing*
S-6	SLO-1	*Definition of Cramer's rule*	*Problems using Gaussian elimination*	*Problems based on Orthogonality and Projections*	*Problems on Positive definite matrices.*	*Simple problems on applications in Image Processing based on Singular value decomposition and Principal component analysis*
	SLO-2	*Problems based on Cramer's rule*	*Problems using Gaussian elimination*	*Problems based on Orthogonality and Projections*	*Problems on Positive definite matrices.*	*Simple problems on applications in Image Processing based on Singular value decomposition and Principal component analysis*
S-7	SLO-1	*Problems based on Cramer's rule*	*Problems using Gaussian elimination*	*Introduction to Gram-Schmidt orthogonalization*	*Introduction to Linear transformations*	*Simple problems on applications in Image Processing based on Singular value decomposition and Principal component analysis*
	SLO-2	*Problems based on Cramer's rule*	*Problems using Gaussian elimination*	*Simple Problems on Gram-Schmidt orthogonalization*	*Problems on Linear transformations*	*Simple problems on applications in Image Processing based on Singular value decomposition and Principal component analysis*
S-8	SLO-1	*Problem solving using tutorial sheet 2 in solving Linear Equations*	*Problem solving using tutorial sheet 5 in Gaussian elimination method*	*Problem solving using tutorial sheet 8 in Orthogonality and Projections*	*Problem solving using tutorial sheet 11 in Positive definite matrices.*	*Problem solving using tutorial sheet 14*
	SLO-2	*Problem solving using tutorial sheet 2 in solving Linear Equations*	*Problem solving using tutorial sheet 5 in Gaussian elimination method*	*Problem solving using tutorial sheet 8 in Orthogonality and Projections*	*Problem solving using tutorial sheet 11 in Linear transformations*	*Problem solving using tutorial sheet 14*
S-9	SLO-1	*Definition of Inverse of a Matrix*	*Definition of LU Decomposition*	*Simple Problems on Gram-Schmidt orthogonalization*	*Definition of Hermitian matrices with examples*	*Introduction to Machine Learning*
	SLO-2	*Problem on Inverse of a Matrix*	*Problems on LU Decomposition*	*Simple Problems on Gram-Schmidt orthogonalization*	*Examples on Hermitian matrices with examples*	*Examples of Machine Learning*
S-10	SLO-1	*Problem on Inverse of a Matrix*	*Problems on LU Decomposition*	*Definition of QR decomposition*	*Problem on Hermitian matrices*	*Simple problems on applications in Machine Learning based on Singular value decomposition and Principal component analysis*
	SLO-2	*Problem on Inverse of a Matrix*	*Problems on LU Decomposition*	*Problems on QR decomposition*	*Problem on Hermitian matrices*	*Simple problems on applications in Machine Learning based on Singular value decomposition and Principal component analysis*
S-11	SLO-1	*Problem on Inverse of a Matrix*	*Solving Systems of Linear Equations using the tools of Matrices*	*Problems on QR decomposition*	*Definition of unitary matrices*	*Simple problems on applications in Machine Learning based on Singular value decomposition and Principal component analysis*
	SLO-2	*Problem on Inverse of a Matrix*	*Solving Systems of Linear Equations using the tools of Matrices*	*Problems on QR decomposition*	*Examples on unitary matrices*	*Simple problems on applications in Machine Learning based on Singular value decomposition and Principal component analysis*

Duration (hour)		Learning Unit / Module 1 12	Learning Unit / Module 2 12	Learning Unit / Module 3 12	Learning Unit / Module 4 12	Learning Unit / Module 5 12
S-12	SLO-1	*Problem solving using tutorial sheet 3 to find Inverse of a Matrix*	*Problem solving using tutorial sheet 6 in Solving Systems of Linear Equations using the tools of Matrices*	*Problem solving using tutorial sheet 9*	*Problem solving using tutorial sheet 12*	*Problem solving using tutorial sheet 15*
	SLO-2	*Problem solving using tutorial sheet 3 to find Inverse of a Matrix*	*Problem solving using tutorial sheet 6 in Solving Systems of Linear Equations using the tools of Matrices*	*Applications of Orthogonality and Projections in Engineering on tutorial sheet 9.*	*Problem solving using tutorial sheet 12*	*Problem solving using tutorial sheet 15*

	REFERENCE BOOKS/OTHER READING MATERIAL
1	*Higher Engineering Mathematics*, B. S. Grewal
2	*Advanced Engineering Mathematics*, 7thEdition, Peter V. O'Neil
3	*Advanced Engineering Mathematics*, 2ndEdition, Michael. D. Greenberg
4	*Introduction to linear algebra*, 5thEdition, Gilbert Strang
5	*Applied Mathematics* (Vol. I & II) , by P. N. Wartikar& J. N. Wartikar
6	*Digital Image Processing*, R C Gonzalez and R E Woods
7	https://machinelearningmastery.com/introduction-matrices-machine-learning/

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	40%	-	30%	-	30%	-	30%	-	30%	-
Level 2	Apply Analyze	40%	-	40%	-	40%	-	40%	-	40%	-
Level 3	Evaluate Create	20%	-	30%	-	30%	-	30%	-	30%	-
	Total	100 %		100 %		100 %		100 %		100%	

CLA –4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,
SLO – Session Learning Outcome

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert from TCS	*Dr.K.C.Sivakumar, IIT, Madras, kcskumar@iitm.ac.in*	*Dr.A.Govindarajan*
		Dr.N.Parvathi

Course Code	18MAB167J	Course Name	STATISTICAL MODELLING	Course Category	B	Basic Sciences	L	T	P	C
							3	0	2	4

Pre-requisite Courses	18MAB162T	Co-requisite Courses	*Nil*	Progressive Courses	
Course Offering Department	*Mathematics*	Data Book / Codes/Standards		Statistical tables	

Course Learning Rationale (CLR):	***The purpose of learning this course is to:***	**Learning**		
		1	**2**	**3**
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	To apply the sampling techniques in Engineering field to understand various sampling methods			
CLR-2 :	To learn the procedure of correlation, regression and ANOVA			
CLR-3 :	To learn the basics and importance of estimate of statistical data			
CLR-4 :	To learn the basics and importance of Non-parametric methods in testing hypothesis			
CLR-5 :	To know the procedure for Time Series Analysis & Forecasting			
CLR-6 :	To comprehend the applications statistical modeling			

Course Learning Outcomes (CLO):	***At the end of this course, learners will be able to:***	**Learning**			**Program Learning Outcomes (PLO)**														
		1	**2**	**3**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Understand the sampling techniques	3	85	80	M	H	L						M	L		H			
CLO-2 :	Pertain the Knowledge of Linear Statistical Models, ANOVA in Engineering field	3	85	80	M	H		M	M				M			H			
CLO-3 :	Gain familiarity in estimate of statistical data	3	85	80		M							M			H			
CLO-4 :	Gaining knowledge in non-parametric methods	3	85	80	M	H	L	M					M	L		H			
CLO-5 :	Getting the knowledge of Time Series Analysis & Forecasting and apply them in the problems in Science and Engineering	3	85	80	M	H	M						M			H			
CLO-6 :	Understanding the concept and applications of statistical modelling	3			M	H							M			H			

Duration (hour)		**Learning Unit / Module 1**	**Learning Unit / Module 2**	**Learning Unit / Module 3**	**Learning Unit / Module 4**	**Learning Unit / Module 5**
		15	**15**	**15**	**15**	**15**
S-1	SLO-1	*Sampling techniques*	*Linear Statistical Models - Introduction*	*Introduction to Estimation*	*Non-parametric Inference*	*Basics of Time Series Analysis & Forecasting*
	SLO-2	*Random sampling*	*Linear Statistical Models - Introduction*	*Point estimation*	*Non-parametric Inference*	*Basics of Time Series Analysis & Forecasting*
S-2	SLO-1	*Sampling from finite and infinite population*	*Simple linear correlation*	*criteria for good estimates (un-biasedness*	*Comparison with parametric inference*	*Stationary models*
	SLO-2	*Simple random sampling*	*Simple linear correlation*	*criteria for good estimates (consistency)*	*Use of order statistics*	*Stationary models identification*
S-3	SLO-1	*Simple random sampling*	*Karl Pearson method*	*Methods of estimation including maximum likelihood estimation.*	*Sign test*	*Stationary models Estimation and Forecasting*
	SLO-2	*Stratified random sampling*	*Spearman rank correlation*	*Methods of estimation including maximum likelihood estimation.*	*Wilcoxon signed rank test*	*Stationary models Estimation and Forecasting*
S-4,5	SLO-1	*Lab 1: Introduction to R*	*Lab 4: Working with Vectors and Matrices*	*Lab 7: Writing Data*	*Lab 10: Manipulating Data*	*Lab 13: Data Frame*
	SLO-2					
S-6	SLO-1	*Systematic sampling*	*Simple linear regression*	*Sufficient Statistic: Concept & examples*	*Mann-Whitney*	*ARIMA Models*
	SLO-2	*Systematic sampling*	*Simple linear regression*	*Sufficient Statistic: Concept & examples*	*Mann-Whitney*	*ARIMA Models identification*
S-7	SLO-1	*Cluster sampling*	*multiple correlation*	*complete sufficiency, their application in estimation*	*Run test*	*ARIMA Models Estimation and Forecasting*

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		15	15	15	15	15
	SLO-2	*Cluster sampling*	*multiple correlation*	*complete sufficiency, their application in estimation*	*Run test*	*ARIMA Models Estimation and Forecasting*
S-8	SLO-1	*Estimates and standard error of sampling with replacement*	*Introduction to Analysis of variance*	*Introduction to Test of hypothesis*	*Kolmogorov-Smirnov test*	*Problems based on ARIMA Models*
	SLO-2	*Estimates and standard error of sampling with replacement*	*One way ANOVA with as well as without interaction*	*Concept & formulation*	*Kolmogorov-Smirnov test*	*Problems based on ARIMA Models*
S-9,10	SLO-1 SLO-2	*Lab 2: Functions-Control flow and Loops*	*Lab 5: Working with Vectors and Matrices*	*Lab 8: Working with Data*	*Lab 11: Manipulating Data*	*Lab 14: Graphics in R*
S-11	SLO-1	*Estimates and standard error of sampling without replacement*	*Problems based on One way ANOVA*	*Type I and Type II errors*	*Spearman's and Kendall's test, Tolerance region*	*Problems based on Stationary models*
	SLO-2	*Sampling distribution of sample mean*	*Problems based on Two way ANOVA*	*Neyman Pearson lemma*	*Spearman's and Kendall's test, Tolerance region*	*Problems based on Stationary models*
S-12	SLO-1 SLO-2	*Applications of sampling distribution of mean*	*Problems based on one and Two way ANOVA*	*Neyman Pearson lemma*	*More problems based on Non-Parametric methods*	*Problems based on Stationary models ARIMA Models*
S-13	SLO-1 SLO-2	*Engineering applications of sampling techniques*	*Applications of Linear Statistical Models and ANOVA in Engineering field*	*Application of estimation and testing hypothesis in Engineering*	*Applications and the importance of Non - Parametric Testing Hypothesis*	*Engineering Applications of Time Series Analysis & Forecasting*
S - 14-15	SLO-1 SLO-2	*Lab 3: Functions-Control flow and Loops*	*Lab 6: Reading in Data*	*Lab 9: Working with Data*	*Lab 12: Simulation - Linear model*	*Lab 15: Graphics in R*

Learning Resources	1. Probability and Statistics for Engineers (4th Edition), I.R. Miller, J.E. Freund and R. Johnson, 2015. 2. Fundamentals of Statistics (Vol. I & Vol. II), A. Gun, M. k. Gupta and B.Dasgupta, 2016. 3. The Analysis of Time Series: An Introduction, Chris Chatfield, Sixth edition-2016.	4. Hands-on Programming with R,- Garrett Grolemund, 2014 5. R for Everyone: Advanced Analytics and Graphics, Jared P. Lander, First edition-2013.

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20 %	20 %	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20 %	20 %	20 %	20 %	20 %	20 %	20 %	20 %	20 %	20 %
	Analyze										
Level 3	Evaluate	10 %	10 %	15 %	15 %	15 %	15 %	15 %	15 %	15 %	15 %
	Create										
	Total	100%		100%		100%		100%		100%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc., SLO – Session Learning Outcome

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert from TCS	Dr.K.C.Sivakumar, IIT, Madras, kcskumar@iitm.ac.in	Dr.A.Govindarajan
		Dr.K.Ganesan

Course Code	18EES162J	Course Name	PRINCIPLES OF ELECTRONICS	Course Category	S	Engineering Sciences	L	T	P	C
							2	0	2	3

Pre-requisite Courses	*Nil*	Co-requisite Courses	*Nil*	Progressive Courses	*Nil*
Course Offering Department	*Computer Science Engineering*	Data Book / Codes/Standards	*Nil*		

Course Learning Rationale (CLR):	*The purpose of learning this course is to: Understand Electronic circuits and design simple circuits*		**Learning**		**Program Learning Outcomes (PLO)**

Course Learning Rationale (CLR):	**The purpose of learning this course is to:**
CLR-1 :	*For the student to understands the use of Silicon based diode and transistor operations he can build complex circuits*
CLR-2 :	*BJT is the initial transistor made, by learning about it the use of multiple pn junction devices can be understood*
CLR-3 :	*MOSFET is a building block for any complex electronic circuit and hence the need to understand its working and application*
CLR-4 :	*Many of electronic circuits are based on signal amplifiers; it can be configured to provide many functionalities*
CLR-5 :	*Without knowing digital electronics, computational circuits are not possible*

Course Learning Outcomes (CLO):	**At the end of this course, learners will be able to:**	**Learning**		
		1	**2**	**3**
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	*Understand physical process of Si based pn junctions; able to design simple circuits using pn junction diodes.*	*2*	*80*	*70*
CLO-2 :	*Understand the working of diodes and BJTs.; In addition he will gain knowledge on using it for simple designs*	*2*	*85*	*75*
CLO-3 :	*Understand the working of MOSFETs and circuits based on it. He will also be capable of making small circuits*	*2*	*85*	*75*
CLO-4 :	*Study and analyze linear and non linear circuits, including amplifiers in small and large signal conditions.*	*4*	*85*	*75*
CLO-5 :	*Design simple digital circuits and analyze, simulate and implement*	*4*	*90*	*85*

Program Learning Outcomes (PLO)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	*H*	*M*	-	-	-	-	-	-	-	-	-	-	*L*	-	-
CLO-2 :	*H*	*M*	-	-	-	-	-	-	-	-	-	-	*M*	-	-
CLO-3 :	*H*	-	*H*	*H*	-	-	-	-	-	-	-	-	-	*M*	-
CLO-4 :	*H*	*H*	-	*H*	-	-	-	-	-	-	-	-	-	*M*	-
CLO-5 :	*H*	*M*	-	*M*	-	-	-	-	-	-	-	-	-	*H*	*L*

Duration (hour)		**12**	**12**	**12**	**12**	**12**
S- 1	SLO- 1	*Crystalline materials*	*BJT formation*	*MOSFET fundamentals*	*Theoretical basis of small signal amplifiers*	*Analog and digital signals, waveform,*
	SLO- 2	*Electrical and mechanical properties*	*Difference between the three regions*	*MOSFET fundamentals*	*Theoretical basis of small signal amplifiers*	*Levels, representation and noise*
S- 2	SLO- 1	*Energy band theory*	*BJT electrical characteristics*	*FET biasing*	*Concept of feed back*	*Boolean Algebra*
	SLO- 2	*Fermi level*	*BJT electrical characteristics*	*Fixed and self biasing*	*Types of feedback and its effects*	*Boolean function and truth tables*
S- 3	SLO- 1	*Pn junction*	*Analysis of BJT in CE mode*	*Depletion and enhancement modes*	*Loop gain and open loop gain*	*Simplification of logic expressions*
	SLO- 2	*Drift and diffusion carriers*	*Biasing and load line effect*	*Depletion and enhancement modes*	*Problems*	*K- map & problems*
S- 4	SLO- 1	*Built-in potential*	*Analysis of CB and CC mode*	*CS configuration analysis*	*Output and input impedance*	*Adder and subtractor*
	SLO- 2	*Biased pn junction*	*Analysis of CB and CC mode*	*Problems*	*Output and input impedance*	*Multipluxers, demultipluxers and its uses*
S 5-6	SLO- 1	*Lab: Simulating pn junction characteristics*	*Lab: BJT characteristics, load line, biasing effects.*	*Lab on FET characteristics, load line, biasing*	*Lab: Simulation of any one MOSFET amplifier and analysis*	*Lab: Implementing a digital function*

Duration (hour)		12	12	12	12	12
	SLO- 2					*using gates and digital ICs, measuring noise.*
S- 7	SLO- 1	*Zener Diodes*	*Cut-off, active and saturation modes*	*CD configuration analysis*	*Operation amplifier*	*Concept of sequential circuits and clock*
	SLO- 2	*LEDs*	*Cut-off, active and saturation modes*	*Problem*	*Typical circuit diagram*	*Flip flop and typical circuit*
S- 8	SLO- 1	*Load line analysis*	*Injection efficiency*	*CG configuration*	*Characteristics of OPAMP*	*Various types of FFs*
	SLO- 2	*Series – parallel configurations of diodes*	*Base transport factor in CE mode*	*Combining configurations*	*Characteristics of OPAMP*	*Various types of FFs*
S- 9	SLO	*AND / OR gates with diodes*	*Current amplification factor in CB mode*	*Designing FET amplifier networks*	*Inverting and non-inverting modes*	*Shift register – serial to parallel*
	SLO- 2	*Rectifiers*	*Current amplification factor in CB mode*	*Problems*	*Problems*	*Parallel to serial*
S- 10	SLO- 1	*Ripple factor and filtering*	*Biasing and stability analysis*	*CMOS fundamentals*	*Applications of OPAMPS: Adder, subtractor, constant gain amplifier*	*Ripple carry counter*
	SLO- 2	*Effect of load on ripple factor*	*Simple CE amplifier*	*Problems*	*Voltage follower, Integrator, differentiator.*	*Synchronous counter*
S 11- 12	SLO- 1	*Lab: Full wave and half wave rectifiers, with and without RC filter*	*Lab: Design and testing of CE amplifier*	*Lab: FET amplifier, simple and cascade*	*Lab: Design and build OPAMP amplifier*	*Lab: Implementation of any one shift register or counter*
	SLO- 2					

Learning Resources	*1. Adel S. Sedra and Kenneth Carless Smith, "Microelectronic Circuits, Theory and applications", 7th edition, Oxford press.2. Jacob Millman, Christos Halkias, Chetan Parikh, "Millman's Integrated Electronics", McGraw Hill, 2017.*	*2. Morismano, "Digital Logic & Computer Design", Pearson, 2017.*

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*20%*	*20%*	*15%*	*15%*	*10%*	*10%*	*10%*	*10%*	*15%*	*15%*
	Understand										
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*30%*	*30%*	*20%*	*30%*	*20%*	*20%*
	Analyze										
Level 3	Evaluate	*10%*	*10%*	*15%*	*15%*	*10%*	*10%*	*10%*	*10%*	*15%*	*15%*
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Experts From TCS		*Prof. V. Natarajan (ECE department SRMIST)*

Course Code	18CSC162J	Course Name	DATA STRUCTURES AND ALGORITHMS	Course Category	C	Professional Core	L	T	P	C
							3	0	4	5

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	
Course Offering Department	Computer Science and Engineering	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	Utilize the different data types; Utilize searching and sorting algorithms for data search
CLR-2 :	Utilize linked list in developing applications
CLR-3 :	Utilize stack and queues in processing data for real-time applications
CLR-4 :	Utilize tree data storage structure for real-time applications
CLR-5 :	Utilize algorithms to find shortest data search in graphs for real-time application development
CLR-6 :	Utilize the different types of data structures and its operations for real-time programming applications

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	Identify linear and non-linear data structures. Create algorithms for searching and sorting	3	80	70
CLO-2 :	Create the different types of linked lists and evaluate its operations	3	85	75
CLO-3 :	Construct stack and queue data structures and evaluate its operations	3	75	70
CLO-4 :	Create tree data structures and evaluate its types and operations	3	85	80
CLO-5 :	Create graph data structure, evaluate its operations, implement algorithms to identify shortest path	3	85	75
CLO-6 :	Construct the different data structures and evaluate their types and operations			

Program Learning Outcomes (PLO)														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
L	H	-	H	L	-	-	-	L	L	-	H	-	-	-
M	H	L	M	L	-	-	-	M	L	-	H	-	-	-
M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
H	H	M	H	L	-	-	-	M	L	-	H	-	-	-
L	H	-	H	L	-	-	-	L	L	-	H	-	-	-

Duration (hour)		21	21	21	21	21
S-1	SLO-1	Introduction-Basic Terminology	Array	General Trees	Graph Terminology	Hashing: Hash functions - Introduction
	SLO-2	Data Structures	Operations on Arrays – Insertion and Deletion	Tree Terminologies	Graph Traversal	Types of hashing
S-2	SLO-1	Data Structure Operations	Applications on Arrays - Multidimensional Arrays- Sparse Matrix	Tree Representation	Topological sorting	Hash functions
	SLO-2	ADT	Linked List Implementation - Insertion	Tree Traversal	Minimum spanning tree – Prims Algorithm	Applications of Hash Table
S-3	SLO-1	Algorithm specification	Linked List- Deletion and Search	Binary Tree Representation	Minimum Spanning Tree - Kruskal's Algorithm	Hashing : Collision avoidance
	SLO-2	Recursion, Performance analysis	Applications of Linked List - Polynomial Arithmetic	Expression Trees	Shortest Path Algorithm: Dijkstra's Algorithm	Hashing : Separate chaining
S 4-7	SLO-1	Lab 1: Implementation of Towers of Hanoi Using recursion	Lab 4 :Implementation of Linked List	Lab 7 :Implementation of Tree Traversals	Lab 10: Implementation of Minimal Spanning Tree	Lab 13: Implementation of Bubble Sort, Insertion sort
	SLO-2					
S-8	SLO-1	Programming Style, Refinement of Coding	Cursor Based Implementation	Binary Tree Traversal	Searching -Linear search	Open Addressing
	SLO-2	Complexity – Time , Space Trade off	Circular Linked List - Applications of Circular List -Joseph Problem	Threaded Binary Tree	Searching -Binary search	Linear Probing
S-9	SLO-1	Mathematical notations	Doubly Linked List Insertion	Binary Search Tree :Construction, Searching	Breadth First search	Quadratic probing

Duration (hour)		21	21	21	21	21
	SLO-2	*Asymptotic notations-Big O, Omega*	*Doubly Linked List Deletion*	*Binary Search Tree : Insertion and Deletion*	*Depth First search*	*Double Hashing*
S-10	SLO-1	*Asymptotic notations - Theta*	*Stack ADT- Stack Array Implementation*	*AVLTrees: Rotations*	*Introduction to Sorting*	*Rehashing*
	SLO-2	*Mathematical functions*	*Stack Linked List Implementation*	*AVL Tree: Insertions*	*Bubble sort*	*Extensible Hashing*
S 11-14	SLO-1	*Lab 2: Implementation of Array – Insertion, Deletion.*	*Lab 5: Implementation of Doubly linked List*	*Lab 8: Implementation of Binary search tree*	*Lab 11:Implementation of Shortest path Algorithm*	*Lab 14 :Implementation of Graph using Array*
	SLO-2					
S-15	SLO-1	*Data Structures and its Types*	*Applications of Stack- Infix to Postfix Conversion*	*B-Trees Constructions*	*Insertion sort*	*Introduction to Files*
	SLO-2	*Linear and Non-Linear Data Structures*	*Applications of Stack- Postfix Evaluation*	*B-Trees Search*	*Selection sort*	*File Organization*
S-16	SLO-1	*1D, 2D Array Initialization using Pointers*	*Applications of Stack- Balancing symbols*	*B-Trees Deletions*	*Shell sort*	*Sequential*
	SLO-2	*1D, 2D Array Accessing usingPointers*	*Queue ADT-Queue Implementation using array - Queue Implementation using Linked List*	*B+ tree*	*Merge sort*	*Direct*
S-17	SLO-1	*Declaring Structure and accessing*	*Circular Queue -Implementation of Circular Queue*	*Splay Trees*	*Quick sort*	*Index Sequential*
	SLO-2	*Declaring Arrays of Structures and accessing*	*Applications of Queue*	*Applications of Trees*	*Heap sort*	*Hashed*
S 18-21	SLO-1	*Lab 3: Implement Structures using Pointers*	*Lab 6: Implementation of Stack and its Applications*	*Lab 9: Implementation of B-Trees*	*Lab 12: Implementation of Quick Sort ,Merge sort*	*Lab 15 :Implementation of File concepts*
	SLO-2					

Learning Resources		
	1. *Fundamentals of Data Structures, E. Horowitz and S. Sahni,1977.* 2. *DataStructuresandAlgorithms,AlfredV.Aho,JohnE.Hopcroft,JeffreyD.Ullman.* 3. *Mark Allen Weiss, Data Structuresand Algorithm Analysis in C, 2nd ed., Pearson Education, 2015*	4. *Reema Thareja, Data Structures Using C, 1st ed., Oxford Higher Education,2011* 5. *Thomas H Cormen, Charles E Leiserson, Ronald L Revest, Clifford Stein, Introduction to Algorithms 3rd ed., The MIT Press Cambridge,2014*

Learning Assessment											
	Bloom's Level of Thinking	**Continuous Learning Assessment (50% weightage)**								**Final Examination (50% weightage)**	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Understand										
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze										
Level 3	Evaluate	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Create										
	Total	100 %		100 %		100 %		100 %		-	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Experts From TCS		***1****. Mr. G. Manoj Kumar, SRMIST*

Course Code	18LEM102J	Course Name	VALUE EDUCATION	Course Category	M	Mandatory	L	T	P	C
							1	0	1	0

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	English and Foreign Languages	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	Connect the learners to their potential, identifytheir potential to create a new positive world			
CLR-2 :	Analyze the merits and demerits of different educational systems. Identify the different systems of education			
CLR-3 :	Draw attention towards the weaknesses they are susceptible to and inspire them through positive models			
CLR-4 :	Instill a sense of professional ethics which help them develop a safe comfortable and prosperous society			
CLR-5 :	Cultivate a spirit of willing accommodation in an increasingly diverse world			
CLR-6 :	Strengthen, enhance the spirit of positivity and facilitate positive contribution in various spheres of life			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Equipped with an awareness of their positive energy and power	2	80	75	L	M	-	-	M	H	-	H	H	H	-	H	-	-	-
CLO-2 :	Identify the meaning of 'education'; have a clearer and better understanding in taking education to the masses	2	75	70	M	H	M	-	H	H	M	M	H	H	-	H	-	-	-
CLO-3 :	Assess their weaknesses; understand risks involved and rectify them through learning from positive and negative instances	2	80	75	M	-	-	-	M	H	M	M	H	H	-	H	-	-	-
CLO-4 :	Realize their professional responsibilities	2	75	70	H	M	-	-	H	H	H	H	H	H	-	H	-	-	-
CLO-5 :	Acquire the required values in an expanding pluralistic world not be swept off their feet due to the rapid changes	2	85	80	M	-	-	-	H	H	H	H	H	H	-	H	-	-	-
CLO-6 :	Equip with better understanding of themselves, society they live. Identify responsibilities in creating a peaceful world	2	80	75	M	M	-	-	H	H	H	H	H	H	-	H	-	-	-

Duration (hour)		Visions for Youth	Youth and Education	Youth and Society	Youth as Professionals	Youth in Pluralistic Society
		6	6	6	6	6
S-1	SLO-1	Introduction	Meaning and the significance of education	Need for social values in the present context	Introduction to professional values	Introduction to pluralistic society, forces of globalization
	SLO-2	Quiz	Brainstorming	Poem – "Where the mind is without fear" Write up on various instances from real life	Brainstorming through visual cues	Group Discussion
S-2	SLO-1	Two speeches by great personalities	Overview of different (traditional, modern) educational systems	Individual and group behavior, respect for others	Engineering societies in India	Science and technology intercultural proximity
	SLO-2	Oral presentations	Debate	Case study on recent happenings	Quiz	Narration of stories from various religions to illustrate the oneness of humanity
S-3	SLO-1	Quotes, proverbs relating to the power and potential of youth, Excerpts: Wings of Fire	Overview of different (traditional, modern) educational systems	Civic sense, bullying-substance abuse, uses of expletives	Challenges to be addressed by Engineers in India	Positive, Negative impact: religion, politics, gender, economic status, aesthetics
	SLO-2	Collecting proverbs highlighting the potential of youth	Debate	Case study on recent happenings	Case Study	Discussion on "To Kill a Mocking Bird"
S-4	SLO-1	Two news articles highlighting the initiatives for social causes by youth	Role of youth in education, Urban and Rural set up, dissemination	Hero worship, gender insensitivity, moral policing	Challenges in different sectors: agriculture	Values required to live in a global society
	SLO-2	Role play in a similar context	Student presentations	Case study on recent happenings	Case Study	Poster presentation on festivals of various religions
S-5	SLO-1	Two news articles highlighting the initiatives for social causes by youth	Designing and framing educational curriculum and materials	Positive contribution by youth in promoting social welfare	Challenges in different sectors: urban development, environment	Learning the etiquettes of various societies

Duration (hour)		*Visions for Youth*	*Youth and Education*	*Youth and Society*	*Youth as Professionals*	*Youth in Pluralistic Society*
		6	6	6	6	6
	SLO-2	*Role play in a similar context*	*Students' Presentation based on write ups*	*Short videos followed by discussions*	*Group activity (oral and written)*	*Poster presentation on festivals of various religions*
S-6	SLO-1	*One song exhibiting the positive energy of youth*	*The pressing challenges in current educational system*	*Positive contribution by youth in promoting social welfare*	*Challenges in different sectors: sustainable development, cyber security*	*Success of pluralistic society, enliven the society, religious harmony through literary*
	SLO-2	*Discussion on the song*	*Collage Design*	*Short videos followed by discussions*	*Case Study – from Newspapers*	*Writing the aspects of pluralistic society based on the text*

Learning Resources	1. *Kalam, APJ Abdul. Wings of Fire: AN Autobiography of APJ Abdul Kalam. Ed. Sangam Books Ltd., 1999* 2. *"Banaras Hindu University Speech" and "To Students". The Voice of Truth. General Editor Shriman Narayan. Navajivan Publishing House. pp. 3-13 and pp. 425-30. www.mkgandhi.org* 3. *Piroda, Sam. "Challenges in Science and Technology". www.nfdindia.org/loc19.htm*	4. *Thomas A Address to VTU Students by Narayana Murthy. https://www.karnataka.com/personalities/narayana-murthy/vtu-address-2006/* 5. *World Economic forum. "India's top 7 challenged from skills to water scarcity*

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (100% weightage)								Final Examination	
		CLA – 1 (20%)		CLA – 2 (30%)		CLA – 3 (30%)		CLA – 4 (20%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	-	-
	Understand										
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	-	-
	Analyze										
Level 3	Evaluate	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	-	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts		
1. Dr. Usha Kodandaraman, ABK AOTS, drushsk@gmail.com	*1. Dr. S. P.Dhanavel, IIT Madras, dhanavelsp@iitmac.in*	*1. Dr .K.Anbazhagan, SRMIST*	*2. Dr. B. Cauveri, SRMIST*	
2. Mr. Durga Prasad Bokka, TCS, durgaprasad@tcs.com	*2. Ms. Subashree, VIT, Chennai, subashree@vit.ac.in*	*3. Dr. M. M.Umamaheswari, SRMIST*	*4. Dr. Sukanya Saha, SRMIST*	*5. Ms .S. Ramya, SRMIST*

Course Code	18LEM103J	Course Name	CHINESE	Course Category	M	Mandatory	L	T	P	C
							2	0	2	0

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	English and Foreign Languages	Data Book / Codes/Standards	NA		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	To help the students to know the pronunciation of the language, To make the students understand the basic concepts Chinese scripts, tones and greetings.
CLR-2 :	To make students understand the basic concept of grammar, to count numbers, Telling time and date, To make simple interrogative sentences and basic conversations.
CLR-3 :	To ask about directions, Focus on class activities through conversation on orientation.
CLR-4 :	Daily activities and asking about places and Chinese etiquette
CLR-5 :	To learn the usage of different verbs and adjectives,
CLR-6 :	This Chinese language course is designed for needs of beginners with no knowledge in Chinese language. This course will develop basic knowledge of the language, gain the four language skills, learning, speaking, reading and writing Chinese scripts.

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Pronounce Chinese Romanization , Get to know about China and the Chinese speaking countries, , Read basic characters	52	60	60	-	-	M	-	M	H	L	M	H	L	-	H	-	-	-
CLO-2 :	To ask about the need, counting numbers , Greet each other, express time and date in daily conversations.	55	65	62	-	-	H	-	H	M	L	M	H	M	-	H	-	-	-
CLO-3 :	To ask different kind of questions , to tell age with the help of Chinese words.	53	68	63	-	-	M	-	M	L	L	M	L	M	-	H	-	-	-
CLO-4 :	To learn different usage of Chinese grammar and vocabulary and introduce own self.	60	69	65	-	-	H	-	H	H	L	M	H	H	-	H	-	-	-
CLO-5 :	To learn about Chinese festivals and Chinese culture, to acquire conversational skills	58	72	63	-	-	H	-	H	H	L	M	M	H	-	H	-	-	-
CLO-6 :	The Chinese language skills will help in career orientation ,to acquire writing ability and communicate with Chinese speaker.	56	70	60	-	-	H	-	H	H	L	M	H	H	-	H	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	General discussion about China , Chinese speaking country, chinese language & culture.	Numbers in Chinese.	Introduction of few basic W/H words and framing basic interrogative sentences	Making of Affirmative negative question in Chinese	Introduction & application of few frequentlyused construction in Chinese.
	SLO-2	Introduction of initials and finals in Mandarin	Counting numbers and numeric system	Nationality	conversation how to make suggestion, how to accept of dealing suggestion and to makecomments.	Introduction & application of few frequentlyused construction in Chinese.
S-2	SLO-1	Tables of combination of initials and finals in Putonghua(Mandarin)	Chinese monetary system， Counting Chinesecurrency.	Direction in Chinese.	Introduction of sentence with nominal predicate, Subjectverb construction as itspredicate.	FamousChinese festivals
	SLO-2	Basic greetings and phrases used in daily life (in pinyin)	Converse to greetothers and express yourneed	Making question wih几,多少	Fruit relatedvocabulary, application.	Major Chinesecities
S-3	SLO-1	Tables of combination of initials and finals in Putonghua(Mandarin)	Asking your need	Introducingone'snationality	.Asking question withma ,whwords, affermative -negative	Application and usage of construction

Duration (hour)		12	12	12	12	12
	SLO-2	*Tables of combination of initials and finals in Putonghua(Mandarin)*	*Nominal measureword*	*Asking aboutnationality*	*Lianxi*	*lianxi*
S-4	SLO-1	*Prononciation of Pinyin chart*	*Telling phone number in chinese*	*Askingprice*	*Asking question withma ,whwords, affermative -negative*	*Application and usage of construction*
	SLO-2	*Prononciation of Pinyin chart*	*Convertingnumbers*	*Lianxi*	*Lianxi*	*lianxi*
S-5	SLO-1	*Introduction of FourTones in Chineselanguage.*	*Time & time relatedgreetings,*	*Politelyand formallyaskingnames ,Expressingapology.*	*MakingChinese sentences with verbal & Adjectival predicate.*	*Grammarrelated to 但是，可是，以前，以后，后来。*
	SLO-2	*Four Tones and relatedpronunciation.*	*Days&Seasons.*	*Introduction & Application of verbal Measure Word.*	*Introduction of 地*	*Introduction & Application of the basic optative verbslike会，能，可以.*
S-6	SLO-1	*Tonesandhi（一，不）in ChineseTonediscrimination in Chinese*	*The basic sentence patterns in Chinese, S-V-O sentences withdetailedexamples.Framing simple sentences.*	*Make sentences with在,and few corelated location wordslike这儿，那儿 withexample*	*Few basic verbs and adjectives.*	*conversation how todescribelikes ,dislikes,interest and hobbies*
	SLO-2	*Introduction of Chinese characters. The eight basic strokes of characters- Chinese characters with proper stoke orders.*	*Introduce是 and 不是*	*Important locations used in daily life.*	*Opposite words.*	*Conduct conversation how todescribelikes, dislikes.,interest and hobbies*
S-7	SLO-1	*Pronounceword in propertone*	*Vocabulary*	*Asking about places..*	*Usage of verbs*	*Usage of grammar*
	SLO-2	*PersonalPronouns and relations,Pluralforms of pronouns*	*Asking date and time*	*lianxi*	*练习*	*lianxi*
S-8	SLO-1	*Writing characters with proper stroke order*	*Usage of time words in a sentence*	*Asking about directions.*	*Usage of adjectives with different adverbs*	*Asking about interest and hobbies*
	SLO-2	*Writing characters with proper stroke order*	*Introducingeachother*	*lianxi*	*练习*	*lianxi*
S-9	SLO-1	*Sentence structure with the adjective 很 and Framing sentences, negative of 很。*	*Weekdays in Chinese, Month, Year&Writing Date.*	*Profession relatedvocabulary, application withexamples.*	*Colour and vocabulary, application withexamples.*	*conversation how to bergain and purchaseproducts.*
	SLO-2	*Introduction of adverb也， Interrogative particle呢， application & Usages.*	*Introduction of verb有 and it'snegativeform.Nominalmeasureword.*	*Basicconversation about personsouccupation*	*conversation how to describeyourfamilymembers and talk about university and department*	*conversation how to bergain and purchaseproducts.*
S-10	SLO-1	*Possesive/ Structural Particle的, application of 的withpronouns. Writing Chinese characters*	*Framing of basic interrogative sentences with modal particle吗。*	*Introduction of interrogative phrase 多大， Tellingone'sage in Chinese.*	*Sports &Gamesrealatedvocabulary, special usages,*	*Use of conjugation还是，或者with example.*
	SLO-2	*basic conversation related to greetings*	*Framing of basic interrogative sentences with modal particle吗。*	*Introduction of pasttenseand aspect particle了。*	*application withexamples.*	
S-11	SLO-1	*Writing greetings in characters with proper stoke order*	*Asking simple question*	*Askingage*	*Askingaboulikes and dislikes*	*Asking about purchasing products*
	SLO-2	*练习*	*Asking date*	*lianxi*	*Askingaboulikes and dislikes*	*Asking about purchasing products*
S-12	SLO-1	*Basic Expression*	*birthday in Chinese*	*Asking about occupation*	*Asking about familymembers*	*Usage of conjugation*
	SLO-2	*练习*	*Grammar – has, have*	*lianxi*	*Asking about familymembers*	*Usage of conjugation*

Learning Resources	1. Text Book- New Practical Chinese reader, Chief editor-Liu Xun, Beijing Language and Culture University Press - 2008 2. Reference Book–Elementary Chinese Reader- 1, Sinolingua Beijing China - 2007

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	20%	20%	15%	15%	15%	15%	15%	15%	-	-
Level 2	Apply Analyze	20%	20%	20%	20%	20%	20%	20%	20%	-	-
Level 3	Evaluate Create	10%	10%	15%	15%	15%	15%	15%	15%	-	-
	Total	100%		100%		100%		100%		-	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. USHA KOTHANDARAMAN, Faculty of Japanese, ABK AOTS DOSOKAI, Chennai, Tamilnadu.	*1. Ms.SubhashriVijaykumar , Assistant Professor VIT chennai,*	*1.Ms. PoulomiGhosal VisistingLecturer SRM University.*
2. Mr. PAUL DAS. Senior Manager, NEC, Chennai	*2. Dr. P.DHANAVEL Professor, IIT, Chennai.*	*2. Mr. SoumyaBrataHalder, VisistingLecturer SRM University*

Course Code	18LEM104J	Course Name	FRENCH	Course Category	M	Mandatory	L	T	P	C
							2	0	2	0

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	English and Foreign Languages	Data Book / Codes/Standards	NA		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	To help the students know the basics of the language and the facts of France, To make the students understand the basic concepts of French grammar, greetings and self-introduction and useful expressions for daily conversations.
CLR-2 :	To identify someone and ask for information. Physical description of people with adjectives. Focus of class activities through conversation
CLR-3 :	to ask and give directions, Focus on class activities through conversation on orientation and an overview of the French educational system.
CLR-4 :	Daily activities and to tell time and the French etiquette. They will also learn to conjugate a reflexive verb and 3rd group of regular verbs in "re"
CLR-5 :	to learn about the diverse French cuisine, the food habits of the French people. Alimentation is associated with partitive articles.
CLR-6 :	This language course is designed to cater to the needs of ''complete beginners". This course is intended to develop basic knowledge of the language, gain the four language skills, learning, speaking, reading and writing and the different aspects of French culture

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Identify and pronounce the letters of the French alphabet, Get to know about France, its culture and the French speaking countries, Greet each other and converse ,Introduce themselves and someone else, Read small dialogues on introduction	55	70	60	-	-	M	-	M	H	L	M	H	H	-	H	-	-	-
CLO-2 :	To describe someone with the help of French adjectives, first group verbs ending in"er" and hence frame simple sentences.	50	65	62	-	-	H	-	H	M	L	M	H	H	-	H	-	-	-
CLO-3 :	Orient someone by giving directions, Express possession and conjugate 2nd group verbs in "ir', Draft their own curriculum vitae.	50	68	63	-	-	L	-	M	L	L	M	L	L	-	H	-	-	-
CLO-4 :	Express time and use the expressions of time in daily conversations, paragraph on daily routine with the help of reflexive verbs.	60	75	65	-	-	H	-	H	H	L	M	H	H	-	H	-	-	-
CLO-5 :	Paragraph on the food habits of the French people and also their own using partitive articles.	58	72	63	-	-	H	-	H	H	L	M	M	H	-	H	-	-	-
CLO-6 :	The language skills coupled with technical skills help in career orientation and to communicate effectively with any French speaker.	56	70	60	-	-	H	-	H	H	L	M	H	H	-	H	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	L'alphabet, Les accents	Les nombres 70 à 100	Les articles contractes (au...)	Les adjectifs démonstratifs	La forme négative (2)(ne…plus, ne…. Jamais
	SLO-2	Les salutations	Les nombres 101 a 1000	Les articles contractes (du..)	La famille	La forme négative (2)(ne…que. Ne… rien)
S-2	SLO-1	Les pronoms sujets, Les verbes: être, avoir, s'appeler, habiter	Le genre des noms	Les verbes : Vouloir, pouvoir, devoir	Les 2 groupes verbes	Les verbes acheter, manger, Commencer, payer
	SLO-2	Les articles indéfinis	le nombre des noms	Les verbes irréguliers	Les verbes : sortir, partir	L'argent
S-3	SLO-1	L'expression	Comprendre une petite annonce	Faire une enquête	Proposer a qqn pour une sortie	Demander le prix

Duration (hour)		12	12	12	12	12
	SLO-2	*Les salutations*	*Rédiger une annonce simple*	*Ecrire une liste*	*Proposer a qqn de faire qqc*	*Faire les courses*
S-4	SLO-1	*Se communiquer en classe*	*Chercher un logement*	*Les gouts des autres*	*Apprécier qqc*	*Les services et les commerces*
	SLO-2	*Epeler, s'appeler*	*Décrire un logement*	*Les temps libres et les loisirs*	*Ne pas apprécier qqc*	*Payer ses achats*
S-5	SLO-1	*Les numéros 0 a 69*	*Le 1 e groupe verbe, les professions*	*Les adjectifs interrogatifs*	*Le 3e groupe verbes*	*L'impératif affirmatif*
	SLO-2	*Les jours, les mois, les émotions*	*Les verbes venir et aller*	*Les mots interrogatifs*	*Les vêtements*	*L'impératif négatif*
S-6	SLO-1	*Les pays, les couleurs*	*Le genre des adjectifs*	*Les verbes pronominaux(1)*	*Les adverbes de fréquence*	*Les articles partitifs*
	SLO-2	*Des portraits de pays francophones*	*les nombre des adjectifs*	*Les verbes pronominaux(1)*	*Les adverbes de temps*	*Les exp. De quantités*
S-7	SLO-1	*Présentez- vous*	*Les vocabulaires des objets*	*Parler de ses loisirs*	*Décrire une tenue*	*Accepter une invitation*
	SLO-2	*Présenterqqn*	*Décrire son voisin*	*Exprimer ses gouts*	*Décrire les accessoires*	*refuser une invitation*
S-8	SLO-1	*S'informer sur qqn*	*Décrire votre profession*	*Exprimer une préférence*	*Parler qqc*	*Donner son appréciation*
	SLO-2	*Demander des informations personnelles*	*La langue, activité recap.*	*Exprimer une envie, Activité quotidienne*	*justifier*	*S'exprimer a table*
S-9	SLO-1	*Les prépositions de lieu (1)*	*Les adjectifs possessifs(sing)*	*Le verbe aller*	*Le passe compose : avoir*	*Le pronom « en » de quantité*
	SLO-2	*Les verbes : parler, habiter*	*Les adjectifs possessifs(pl)*	*Le futur proche*	*Le passe compose :etre*	*Il faut*
S-10	SLO-1	*Les articles définis*	*Les prépositions de lieu(2)*	*L'heure*	*L\imparfait (1)*	*Les festivals du mot*
	SLO-2	*Les pronoms Personnelles*	*Les orientations*	*Les Temps*	*L'imparfait (2)*	*Les festivals en France*
S-11	SLO-1	*Demander poliment*	*Les pièces, l'équipement*	*Demander l'heure*	*Parler d'un film*	*Donner des instructions (il Faut)*
	SLO-2	*Répondre poliment*	*S'infirmer un logement*	*Dire l'heure*	*Féliciterun souhait*	*Cuisine d'une parisienne d'adoption*
S-12	SLO-1	*Les vocabulaires d'informatique*	*Ecrire un portrait*	*Raconter sa vie sur un blog*	*Adresser un souhait*	*Commander au restaurant*
	SLO-2	*S'inscrire sur un site*	*La description physique*	*Justifier*	*Ecrire une carte postale*	*Ecrire une recette*

Learning Resources	1. *SAISONS 1 – Didier - 2017* 2. *BIENVENUE –Course Book in French – Department of EFL, SRMIST- 2017*

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	-	-
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	-	-
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	-	-
	Create										
	Total	100%		100%		100%		100%		-	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
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Mr. Durga Prasad Bokka, TCS	*DR.S.P. Dhanavel Professor Dept of English IIT - Chennai*	*Ms. K.Sankari, Assistant Professor Dept of EFL SRMIST*

Course Code	18LEM105J	Course Name	GERMAN	Course Category	M	Mandatory	L	T	P	C
							2	0	2	0

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	English and Foreign Languages	Data Book / Codes/Standards	NA		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	To help the students know the Basics of the language like Grammar, Self introduction and greetings.			
CLR-2 :	To learn how to introduce oneself and ask and give information about others and express simple terms like hobbies, Telephone numbers.			
CLR-3 :	To ask and give directions, an overview of German cities, buildings and everyday life like Cuisine.			
CLR-4 :	To develop the ability among the students to read, understand and initiate the conversation.			
CLR-5 :	To enable the students to achieve basic conversational skills.			
CLR-6 :	They can understand and use familiar everyday expressions and very simple sentences in German.			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	To know the culture, geography, greet each other and introduce themselves.	55	70	60	-	-	L	L	M	H	L	H	H	H	-	H	-	-	-
CLO-2 :	To compose dialogue between strangers to ask for simple information's like telephone numbers, seasons etc ..,	60	65	55	-	-	M	L	M	H	L	H	H	H	-	H	-	-	-
CLO-3 :	To help someone with directions by using Imperatives and different types of definite & indefinite articles.	65	73	60	-	-	M	M	H	M	M	H	H	H	-	H	-	-	-
CLO-4 :	To write a dialogue during shopping by using different verbs of Accusative articles.	65	65	55	-	-	M	M	H	H	M	H	H	H	-	H	-	-	-
CLO-5 :	To know how to order food, different varieties of food in Germany and also hold conversation in the Restaurant.	57	65	55	-	-	M	M	H	H	L	H	H	H	-	H	-	-	-
CLO-6 :	To know the culture, geography, greet each other and introduce themselves.	55	70	60	-	-	L	L	M	H	L	H	H	H	-	H	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Alphabets, Grüßen und Verabschieden.	UmbestimmtArtikelimNominativ.	T, N, Dverbenkonjugationen und Satzschreiben.	Die Uhezeitenverstehen und nennen.	Etwasgemeinsamplanen, überGeburtstagsprechen.
	SLO-2	Über Länder und Sprachensprechenim Deutschland, WichtigeStädteim Deutschland.	Zahlenbis1000 undWortschatz.	Ordinal Zahlen und Tagezeiten	Zeitangabenmachen.	SchreibenSie: EinladungfürihreGeburtstag.
S-2	SLO-1	Zahelenbis 20, Sichund andereVorstellen.	Plätze und Gebäudebenennen, Fragenzuortenstellen.	Überessensprechen und VerschiedeneGerichte in Deutschland durch PPT.	Umregelmäßige verbenkonjugationen und BeispieleSatz.	Possessive ArtikelimAkkuativ.
	SLO-2	Telefonnummer und E-mail Adressenennen.	Negation und übersetzung.	Buchstabieren und Wortschtz.	"ieren" verben conjugation und Beispielesatz.	BeispieleSätze.
S-3	SLO-1	Alphabet Aussprache und hört die grüßen.	Hörübung: Die Telefonnummer.	Hörübung: Aussprache die Umlauteä, ö, ü und beispieleSätze.	Hörübung: Dem Dialog zuhören und die Zeitschreiben.	E-mail schreiben: EinladungihrerGeburtstagsferier.
	SLO-2	VerabschiedenenWörten.	Buchstabieren und Wortschtz.	Hören und buchstabieren.	Übungen.	Übungen.
S-4	SLO-1	Länder und Sprachen Der Film: Über den Guten Tag und die Telefonnummer.	Der Film: Über die Sehenwürdigkeiten in Detschland.	Dialog: Über das Essen und seine preisepraktizieren.	Mit den Reguläßige und Umregelmäßigen verbeneigeneSätzeschreiben	Das Gesprächhörenund verstehen.
	SLO-2	Übungen.	Sprechen über den wichtigeStädteim Deutschland.	Übungen.	"ieren" verbenkonjugationen.	Wortschatz und buchstabieren.

Duration (hour)		12	12	12	12	12
S-5	SLO-1	*Über Länder und Sprachensprechen.*	*Himmelsrichtungenund Verkehrsmittelnennen.*	*EinenEinkaufPlanen und sprechen*	*Über die Familiesprechenundsichverabreden.*	*Das Briefeschreibenerklären, eineEinldungverstehen und schreiben.*
	SLO-2	*Hören und buchstabieren.*	*NachdemWegfragen und einemWegbeschreiben*	*GesprächebeimEinkaufführen.*	*Sichfüreineverspätungentschuldigen.*	*Personal pronomen und beispieleSätze.*
S-6	SLO-1	*Aussagesatz und personal pronomen in Nominativ und beispieleSätze.*	*Textemitinternationalenwörternverstehen.*	*Gesprächebeim Essen führen.*	*EinenTermintelefonischvereinbaren.*	*ImRestaurentbestellen und bezahlen, übereinEreignissprechen,*
	SLO-2	*ÜberArbeit, Berufe und Arbeitszeitensprechen.*	*Artikellernen.*	*W-fragentexteverstehen.*	*SchreibenSie die Uhrzeiten.*	*BestimmtInformationen in Textenfinden.*
S-7	SLO-1	*Übersich und anderesprechen.*	*Hörübung: SchreibenSie die Zahlen.*	*Kurzer Dialog über das Einkaufen.*	*Üben: Wie man den Terminfestlegt.*	*SchreibeneinesBriefesüberjedegegebene situation.*
	SLO-2	*Fragen und antworten.*	*Events im Hamburg.*	*Übungen: Verbenkonjugationen.*	*Hören und buchstabieren.*	*Übungen: TrennbareVerbenkonjugationen.*
S-8	SLO-1	*Sich und anderevorstellen.*	*FragenSie die Wegbeschreibungindemsie die Bildersehen.*	*Kurzer Dialog über das Essen.*	*Hörübung: Die Zeitdurchhören des Dialogs schreiben.*	*Hörübung und Schreiben: Freizeitaktivitäten.*
	SLO-2	*W-Fragen.*	*Lesen und verstehen.*	*Hören: wie man bestellt.*	*Übungen.*	*Satzmithilfsverben.*
S-9	SLO-1	*Zahlenab 20 nennen, überJahrezeitenim Deutschland.*	*ImperativmitSie, Lesen und verstehen.*	*Wortschatz und Buchstabieren.*	*UmbestimmtArtikelimAkkusativ.*	*Untrennbareverbenkonjugationen.BeispieleSätze.*
	SLO-2	*Wochentage und Monate.*	*Lange und KurzeVokale.*	*SchreibenSie die Sätze.*	*Zeitangabenmit am, um, von…. bis.*	*BeispieleSätze.*
S-10	SLO-1	*BestimmtArtikel in Nominativ.*	*Regelmäßige verbenKonjugationen.*	*PositionenimSatz, BestimmtArtikelimAkkusativ.*	*Erklärt die Grammatik PräpositionenimAkkusativ.*	*Präteritum von Hilfsverben undkonjugationen.*
	SLO-2	*Verwendungen von Hilfsverben.*	*Satzschreiben.*	*AkkusativVerbenkonjugationen.*	*BeispieleSätzeimPräpositionen .*	*Modal verbenkonjugationen und beispieleSätze.*
S-11	SLO-1	*JaoderNeinFragendurch PPT.*	*Der Imperetivsätze und auch die Regelmäßigeverben*	*Essen im D-A-CH, Beruferund ums Essen.*	*Hören und sprechen: die Tagesablauf.*	*Übungfür Modal verbenwie, Aussagesatz, Satzfrage.*
	SLO-2	*Typische Hobby's.*	*LernenSie die Sätzedurch PPT.*	*HörenSie den dialog.*	*Schreiben: Die Tagesabluf.*	*W-Frage und Trennabreverben.*
S-12	SLO-1	*Der Film: Über den Termin.*	*Der Film: Die Autofahrt und das Verkehrsmittel.*	*Der Film: Frühstückbei den Bergs.*	*Pünktlichkeit in D-A-CH und Der Film: Nie hast du Zeit und Termine.*	*Der Film: Hast du Zeit? Im Restaurant und Überraschung.*
	SLO-2	*ÜberdeineFamilie.*	*Claudia Berg in der Arbeit.*	*Einkaufenplanen.*	*Der Termin und die Verabredung.*	*SchreibenSie die SätzemitHilfsverben.*

Learning Resources	1. *Netzwerk – Klett – Langeiseheidt , Munchen- 2015* 2. *Grundkurs Deutsch – Dept.of EFL - SRMIST*

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	20%	20%	15%	15%	15%	15%	15%	15%	-	-
Level 2	Apply Analyze	20%	20%	20%	20%	20%	20%	20%	20%	-	-
Level 3	Evaluate Create	10%	10%	15%	15%	15%	15%	15%	15%	-	-
	Total	100%		100%		100%		100%		-	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr. UshaKodandaraman, ABK AOTS, Chennai .drushak@gmail.com	*Ms. SubhashriVijaykumar, Assistant Professor VIT chennai,*	*Dr.K.Anbazhagan Prof &Head, Dept of EFL SRMIST*
Mr. VivekRaghunathan Language Expert, Health care Vivek.raghunathan@waikatodhb.health.nz	*DR.S.P. Dhanavel Professor Dept of English IIT - Chennai*	*Ms.Srilitha Srinivasan , Assistant Professor Dept of EFL SRMIST*
		Dr.P.Tamilarasan, Assistant Professor *Dept of EFL, SRMIST*

Course Code	18LEM106J	Course Name	JAPANESE	Course Category	M	Mandatory	L	T	P	C
							2	0	2	0

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	English and Foreign Languages	Data Book / Codes/Standards	NA		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
CLR-1 :	To help the students know the basics of the language and the facts of Japan, To make the students understand the basic concepts of Japan grammar, greetings and self-introduction and useful expressions for daily conversations	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-2 :	To identify someone and ask for information. Physical description of people with adjectives. Focus of class activities through conversation			
CLR-3 :	to ask and give directions, Focus on class activities through conversation on orientation and an overview of the Japan educational system			
CLR-4 :	Daily activities and to tell time and the Japan etiquette. They will also learn to conjugate a reflexive verb and 3rd group of regular verbs in			
CLR-5 :	to learn about the diverse , the food habits of the Japanese people. Alimentation isassociatedwith partitive articles.			
CLR-6 :	This language course is designed to cater to the needs of ''complete beginners". This course is intended to develop basic knowledge of the language, gain the four language skills, learning, speaking, reading and writing and the different aspects of Japan culture			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1 :	Identify and pronounce the letters of the Japan alphabet, Get to know about Japan, its culture. Greet each other and converse ,Introduce themselves and someone else.	55	70	60	M	L	L	L	M	H	M	H	H	M	L	H	M	M	M
CLO-2 :	To describe someone with the help of Japan adjectives, first group verbs ending in e and hence frame simple sentences.	50	65	62	M	L	L	L	M	H	M	H	H	M	L	H	M	M	M
CLO-3 :	Orient someone by giving directions, Express possession and conjugate 2nd group verbs. Draft their own curriculum vitae.	50	68	63	M	L	L	L	M	H	M	H	H	M	L	H	M	M	M
CLO-4 :	Express time and use the expressions of time in daily conversations, paragraph on daily routine with the help of reflexive verbs.	60	75	65	M	L	L	L	M	H	M	H	H	M	L	H	M	M	M
CLO-5 :	Paragraph on the food habits of the Japan people and also their own using particles.	58	72	63	M	L	L	L	M	H	M	H	H	M	L	H	M	M	M
CLO-6 :	The language skills coupled with technical skills help in career orientation and to communicate effectively with any Japanese speaker.	58	72	63	M	L	L	L	M	H	M	H	H	M	L	H	M	M	M

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Introduction to Japan	Hiragana Lesson 7 Ma and Ya series.	Lesson 5 – Particles.	Lesson 6 – renshuu and exercises	Lesson 9Renshuu
	SLO-2	Japanese language and culture	ma/ya series related words	Japanese sports.	Religious beliefs,.	Explanation of ~te form I Group
S-2	SLO-1	Greetings	Lesson 3 – time - reading	Japanese martial arts.	Lesson 7 – reading and grammar	Explanation of ~te form II Group
	SLO-2	SelfIntroduction	Lesson 3 grammar.Classroom expressions. Kara, made, ni, ne and o	De and to	Ongaku and manga	Explanation of ~te form II and III Group
S-3	SLO-1	Hiragana Lesson 1 (vowels and related words)	Hiragana Lesson 8 Ra/Wa series	Kanji	Common expressions	Exceptional cases of verb groups
	SLO-2	Lesson1– reading. Selfintroduction	Ra/Wa series related words	iku, miru, yasumu and kau	Bodyparts (vocabulary).	Line
S-4	SLO-1	Lesson 1 grammar (wa,ka,mo,no,desu/jaarimasen)	Lesson 3 – renshuu and exercises	Revision of complete Hiragana	Explanation of past tense of verbs.	Lesson 10 - reading and grammar

Duration (hour)		12	12	12	12	12
	SLO-2	*Days of the week*	*Family. Festivals of Japan.Omiyage*	*Revision of all Particles*	*Kanji – kuchi, ame, hairimasu, kirimasu, ji, han and fun*	*Explanation of ~tai form*
S-5	SLO-1	*Hiragana Lesson 2*	*Hiragana Lesson 9*	*Assignment*	*Lesson 7 reading.*	*Japanese currency.*
	SLO-2	*ka and ga series and related words*	*Double consonants and related words*	*Assignment*	*Lesson 7 exercises*	*Japanese political system*
S-6	SLO-1	*Lesson 1 – renshuu*	*Lesson 4 – reading, grammar and vocabulary*	*Surprise Test*	*Introduction to Adjectives*	*Lesson 10 –renshuu and exercises.*
	SLO-2	*Ojigiand exercises. Numbers and months*	*Directions. Kanji – person, man, woman, child, tree and book*	*Surprise Test*	*I-ending and na-ending adjectives Forms.*	*Kanji – ookii, chiisai, eki and chuui*
S-7	SLO-1	*Hiragana Lesson 3*	*Directions. Kono…, kochira…, yo.*	*Revision of Hiragana (3 charts),*	*Lesson 8 Reading*	*Kanji – daigaku, nen, nihon and nihongo*
	SLO-2	*sa and za series and related words*	*I &na-ending adjectives introduction*	*long vowels and double consonants*	*Lesson 8 grammar*	*Places of interest in Japan*
S-8	SLO-1	*Seasons.*	*Hiragana Lesson 10(long vowels and related words).*	*Review of grammar*	*Explanation of ~masenka*	*Food and drink (vocabulary).*
	SLO-2	*Kore/kono – demonstrative pronouns*	*Lesson 4 – renshuu*	*particles*	*Explanation of mashou*	*Transport*
S-9	SLO-1	*Hiragana Lessons 4 and 5*	*Hashi*	*Katakana – introduction*	*Lesson 8 –renshuu.*	*Review of particles*
	SLO-2	*ta/da and na/ha series and related words*	*Hiragana Lesson 11 (chart 3 and related words).*	*Katakana – rules.*	*Value your time*	*Review of Kana and Kanji*
S-10	SLO-1	*Kore…/kono…-reading, grammar and vocabulary*	*Counters explanation*	*Review of lessons 1-5*	*Kanji - days of the week*	*Review of verbs and adjectives*
	SLO-2	*Ni and ga, arimasu/imasu, Dare/donata.Renshuu and Meishi*	*Kanji – days of the week*	*Grammar and vocabulary*	*Japanese food and*	*Japanese house and living style*
S-11	SLO-1	*Hiragana Lesson 6 (ba/pa series).*	*Hiragana – special words like wa, e and o and sentence reading*	*Katakana vocabulary*	*Lesson 9 reading*	*Japanese tea ceremony*
	SLO-2	*Lesson 2 – exercises. Introduction to time.*	*Lesson 5 – reading.*	*Kanji – ikimasu, mimasu, yasumimasu*	*Lesson 9 grammar*	*Japanese Religious beliefs.*
S-12	SLO-1	*Kanji numbers – 13. Time expressions*	*Lesson 5 Grammar.*	*Lesson 6 – reading and grammar*	*Stationery*	*Japanese Economy*
	SLO-2	*Coloursand basic 5 kanjis (ue, shita, naka, yama and kawa)*	*Lesson 5 Vocabulary.*	*Visiting a Japanese home*	*Transport (vocabulary)*	*Calligraphy*

Learning Resources	*1. Minna no Nihon Go – 3A Corporation, Tokyo, Japan – 2002.* *2. A Basic Course in Japanese–Department of EFL,SRMIST- 2017*

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	-	-
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	-	-
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	-	-
	Create										
	Total	100%		100%		100%		100%		-	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

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Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1 Dr. Usha Kothandaraman, Faculty of Japanese, ABK AOTS DOSOKAI, Chennai, Tamilnadu.	*1. Dr. K. Anbazhagan, Professor and Head, Department of EFL. SRM University.*	*1. Ms .R .Padmajaa, Assistant Professor SRM University.*
2. Mr. PAUL DAS. Senior Manager, NEC, Chennai	*2 Dr. P.DHANAVEL Professor, IIT, Chennai.*	*2. Mr. B.VIJAYA KUMAR, Assistant Professor SRM University*

Course Code	18LEM107J	Course Name	KOREAN	Course Category	M	Mandatory	L	T	P	C
							2	0	2	0

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	English and Foreign Languages	Data Book / Codes/Standards	NA		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Learn about Korea and its culture; to be able to read and write the Korean script, and to introduce oneself and other people in the language.	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLR-2 :	Be able to manage daily life living in Korea - talking about daily activities, asking for and giving directions, describing the location of things, learning numbers and to shop for things (asking for items and the number of said items).																		
CLR-3 :	Be able to shop by asking for the availability of things, and learning about the currency system; To be able to talk about past activities (past tense) and the weather.																		
CLR-4 :	Tell time, to socialize: make appointments, phone calls																		
CLR-5 :	Communicate about studying Korean and about future career or academic plans.																		
CLR-6 :	This course is designed to develop the basic knowledge of the country and the language by training the candidate in reading, writing, listening and speaking. The conversational level of various basic topics covered in the course eliminates the fundamental hardships of language barriers faced in Korea.																		
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																		
CLO-1 :	Read, pronounce and write the Korean script, and to introduce oneself and other people in the language. Get to know about Korea, its culture and its language.	55	70	60	-	-	L	-	H	H	L	M	M	H	-	H	-	-	-
CLO-2 :	Manage daily life in Korea - ask for and give directions, describe locations, count, shop, and talk about daily activities.	65	55	52	-	-	L	-	H	M	L	M	H	H	-	H	-	-	-
CLO-3 :	Talk about past activities (past tense), the weather and use the Korean currency.	50	65	63	-	-	L	-	M	H	L	M	M	M	-	H	-	-	-
CLO-4 :	Tell time, to socialize: make appointments, phone call etiquettes	60	70	64	-	-	L	-	H	H	L	M	H	H	-	H	-	-	-
CLO-5 :	Communicate about studying Korean and about future career or academic plans.	65	70	67	-	-	L	-	H	M	L	M	H	H	-	H	-	-	-
CLO-6 :	Read, write and converse effectively in basic Korean, making it easy to even live in the country.	60	65	60	-	-	L	-	H	H	L	M	H	H	-	H	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Introduction to Korea and Korean - 한글소개, 한국 소개	일상 생활daily life, new vocab (action, places)	listening &key sentences drilling	dialogue1& dialogue2	grammar point 1-그래서
	SLO-2			reading/writing		grammar point1-(으)ㄹ거예요
S-2	SLO-1	single vowels (단모음)	grammar point1-아요/ 어요&grammar point2-에 가다	new vocab (counter noun)	listening &key sentences drilling	dialogue1& dialogue2
	SLO-2				reading/writing	
S-3	SLO-1	이중모음과 자음 double vowels & basic consonants	dialogue1& dialogue2	grammar point1-ㅂ니다/습니다,-ㅂ니까/습니까&	시간 time new vocab (time)	listening & reading
	SLO-2					
S-4	SLO-1	쌍 자음과 음절double consonants & syllables	listening & reading/writing	teaching money	Teaching date & weeks	writing for weekend activities
	SLO-2					
S-5	SLO-1	받침과 음절1 Batchim & syllables	위치location new vocab(object /location)	dialogue1& dialogue2 practice	grammar point1-에	한국어 공부(studying Korean) new vocab(pronouns)
	SLO-2				grammar point2-시-분	
S-6	SLO-1	받침과 음절2 Batchim & syllables	grammar point1-이/가	listening &key sentences drilling	dialogue1& dialogue2 practice	grammar point1- 나/저, 내/제
	SLO-2		grammar point2-에 있다/없다	reading/writing		grammar point2-'ㄷ' irregular verbs

S-7	SLO-1	자모 연습. (practices vowels and consonants)	dialogue1& dialogue2 practice	어제 일과yesterday's daily routine new vocab (action, places)	listening &key sentences drilling	dialogue1& dialogue2 practice
	SLO-2				reading/writing	
S-8	SLO-1	듣기. 교실 표현(listening & class terms)	listening &key sentences drilling	grammar point1-았/었	약속 appointment new vocab(location& plan	listening &key sentences drilling
	SLO-2		reading/writing	grammar point2-에서		reading/writing
S-9	SLO-1	자기소개self –introduction , new vocab(nationality, occupation	쇼핑1shopping1 new vocab (items to shop)	dialogue1& dialogue2 practice	grammar point1- (으)ㄹ까요	계획(plan) –(으)ㄹ 거예요.
	SLO-2				grammar point2-아요/어요	
S-10	SLO-1	grammar point1-이/에요/예요	shopping1teaching numbers	listening &key sentences drilling	dialogue1& dialogue2 practice	grammar point1- pro nouns 이/그/저 + 것(things)
	SLO-2	grammar point2-은/는		reading/writing		grammar point2- 'ㅡ' irregular verbs & dialogue2
S-11	SLO-1	dialogue1& dialogue2 practice	grammar point1-을/를	날씨 weather new vocab(season& weather)	listening &key sentences drilling	dialogue1& dialogue2 practice
	SLO-2		grammar point2-(으)세요		reading/writing	
S-12	SLO-1	listening &key sentences drilling	dialogue1& dialogue2 practice	grammar point1-그리고	Phone Call new vocab and expressions, key sentences	listening &key sentences drilling
	SLO-2	reading/writing		grammar point2-안		reading/writing

Learning Resources	1. ACTIVE KOREAN 1 – Language Education Institute, Seoul National University – Moonjin Media – 2006 2. ACTIVE KOREAN 1 WORKBOOK – Language Education Institute, Seoul National University – Moonjin Media – 2010 3. SEJONG KOREAN 1 – The National Institute of Korean Language – Hawoo - 2013

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	-	-
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	-	-
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	-	-
	Create										
	Total	100%		100%		100%		100%		-	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1 Dr. USHA KOTHANDARAMAN, Faculty of Japanese, ABK AOTS DOSOKAI, Chennai, Tamilnadu.	*1. Ms. Subhashri Vijaykumar , Assistant Professor VIT chennai,*	*1Jang kyung A Visiting faculty Korean SRMIST*
2. Mr. PAUL DAS. Senior Manager, NEC, Chennai	*2 Dr. P.DHANAVEL Professor, IIT, Chennai.*	*2. Ms.Cho Seul Hee Visiting faculty Korean SRMIST*

Semester - III

Course Code	18MBH461T	Course Name	FINANCIAL MANAGEMENT	Course Category	H	Humanities & Social Sciences	L	T	P	C
							2	0	0	2

Pre-requisite Courses	*Nil*	Co-requisite Courses	*Nil*	Progressive Courses	
Course Offering Department	*Faculty of Management*	Data Book / Codes/Standards		Nil	

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*	**Learning**		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	*Importance of Financial Management to make good business decisions*			
CLR-2 :	*Significance of Financial market and its linkage with business*			
CLR-3 :	*Long Term Sources available for a firm*			
CLR-4 :	*Application of tools and techniques for selection of projects*			
CLR-5 :	*Importance of Cost of Capital and Capital Structure for financing decisions*			
CLR-6 :	*Importance of Liquidity and Dividend decisions*			

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	**Learning**			**Program Learning Outcomes (PLO)**														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	*To learn the importance of financial management for financial decision making*	*1*	*60*	*50*	*H*	*M*	*M*	*H*	*M*	*L*	*H*	*M*	*M*	*M*	*L*	*H*	*1*	*60*	*50*
CLO-2 :	*To learn the concepts of financial market*	*2*	*80*	*75*	*H*	*L*	*M*	*H*	*L*	*L*	*H*	*L*	*M*	*L*	*L*	*H*	*2*	*80*	*75*
CLO-3 :	*To learn the pros and cons of various sources of finance*	*2*	*80*	*70*	*H*	*M*	*M*	*H*	*M*	*M*	*H*	*M*	*M*	*M*	*M*	*H*	*2*	*80*	*70*
CLO-4 :	*To apply the tools and techniques for investment decisions*	*3*	*90*	*80*	*H*	*L*	*M*	*H*	*L*	*M*	*H*	*L*	*M*	*L*	*M*	*H*	*3*	*90*	*80*
CLO-5 :	*To apply Cost of Capital and Capital Structure for financing decisions*	*3*	*90*	*80*	*H*	*H*	*M*	*M*	*H*	*M*	*M*	*H*	*M*	*H*	*M*	*M*	*3*	*90*	*80*
CLO-6 :	*To apply working capital concepts to maintain liquidity and to learn the aspects of dividend decisions*	*1*	*50*	*70*	*H*	*M*	*H*	*H*	*M*	*H*	*H*	*M*	*H*	*M*	*H*	*H*	*1*	*50*	*70*

Duration (hour)		6	6	6	6	6
S-1	SLO-1	*Introduction to Finance – meaning, traditional versus modern approach*	*Introduction to Financial Markets*	*Investment Decision: Meaning of Capital Budgeting; Examples of Capital Expenditure*	*Financing Decision: Cost of Capital – meaning and significance; Risk-return relationship of various securities with diagram*	*Liquidity Decision: Working Capital Management – meaning and objectives*
	SLO-2	*Major financial decisions*	*Components of Financial Markets*	*Nature of Capital Budgeting; Types of Investments*	*Overall versus Specific cost of capital*	*Types of Working Capital and Factors affecting Working Capital*
S-2	SLO-1	*Scope of Finance function; Key activities of financial management*	*Indian Capital Market*	*Evaluation Techniques – types, formula, decision rule, merits and demerits*	*Determination of cost of debt – issued at par, premium or discount for redeemable and irredeemable debt*	*Determination of working capital requirements of a firm*
	SLO-2	*Risk-return tradeoff*		*Payback period*		
S-3	SLO-1	*Financial Objectives of a firm*	*New Issues Market*	*Accounting Rate of Return*	*Determination of cost of equity using Gordon dividend growth model and Capital Asset Pricing Model (CAPM)*	*Operating Cycle – concept and estimation*
	SLO-2	*Functions of Modern Finance Manager*				
S-4	SLO-1	*Time value of money - Future value versus Present value of Uneven cash flow and Annuity – simple problems*	*Indian Stock Market*	*Net Present Value*	*Determination of cost of preference – redeemable and irredeemable shares*	*Short term sources of finance*
	SLO-2					
S-5	SLO-1		*ndian Money Market*	*Profitability Index*		

	SLO-2	*Concept of Risk and Return of individual asset - Simple problems*			*Determination of Overall / Weighted Average Cost of Capital (WACC)*	*Dividend Decision – meaning of dividend and dividend policy Factors affecting dividend policy*
S-6	SLO-1	*Risk and return of a portfolio - Simple problems*	*Long term sources of finance*	*Internal Rate of Return*	*Concept of Capital Structure Factors affecting capital structure*	*Forms of Dividend Concept of Bonus issue, Rights issue, Share split and Share buyback with examples*
	SLO-2					

Learning Resources	*1. M. Pandey Financial Management, Vikas Publishing House Pvt. Ltd., 10th edition, 2012* *2. M.Y. Khan and P.K.Jain Financial management, Text, Problems and cases Tata McGraw Hill, 6th edition, 2011* *3. Aswat Damodaran, Corporate Finance Theory and practice, John Wiley & Sons, 2011* *4. James C. Vanhorne –Fundamentals of Financial Management– PHI Learning, 11th Edition, 2012*	*5. Brigham, Ehrhardt, Financial Management Theory and Practice, 12th edition, Cengage Learning 2010.* *6. Prasanna Chandra, Financial Management, 9th edition, Tata McGraw Hill, 2012.* *7. Srivatsava, Mishra, Financial Management, Oxford University Press, 2011*

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*40%*	-	*30%*	-	*30%*	-	*30%*	-	*30%*	-
	Understand										
Level 2	Apply	*40%*	-	*40%*	-	*40%*	-	*40%*	-	*40%*	-
	Analyze										
Level 3	Evaluate	*20%*	-	*30%*	-	*30%*	-	*30%*	-	*30%*	-
	Create										
	Total	*100 %*		*100 %*		*100 %*		*100 %*		*100%*	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert from TCS	*Dr. Siva Sankaran, IIM Ranchi*	*Dr. Kavitha Shanmugam*
	Dr. Narasiman, IIM Bangalore	*Dr. T. Vijay Kumar*

Course Code	18MBH462T	Course Name	HUMAN RESOURCE MANAGEMENT	Course Category	H	Humanities & Social Sciences	L	T	P	C
							2	0	0	2

Pre-requisite Courses	*Nil*	Co-requisite Courses	*Nil*	Progressive Courses	
Course Offering Department	*Faculty of Management*		Data Book / Codes/Standards	Nil	

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*
CLR-1 :	*To Understand the various standpoints prevailing in Human Resource Management*
CLR-2 :	*Examine the best practices in Human Resource Planning and Forecasting.*
CLR-3 :	*Classify the need for training and its development practices.*
CLR-4 :	*Comprehend the employee interest to persuade motivation and develop Employee Engagement*
CLR-5 :	*Learn the technique of Performance Evaluation and control of process in the Organization*
CLR-6 :	*Understand the importance of Human Resource Management in Organizational effectiveness`*

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	**Learning**			**Program Learning Outcomes (PLO)**														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	*Apply the conceptual knowledge of Human Resource Management in managing the work force*	*2*	*60*	*50*	*H*	*M*	*H*	*M*	*L*	*M*	*M*	*M*	*L*	*M*	*H*	*L*	*2*	*60*	*50*
CLO-2 :	*Analyze the gap between the demand and supply of Human Resource.*	*2*	*80*	*70*	*L*	*H*	*L*	*L*	*M*	*M*	*M*	*L*	*L*	*M*	*H*	*H*	*2*	*80*	*70*
CLO-3 :	*Analyze the training models and its effective delivery methodology*	*1*	*80*	*75*	*M*	*H*	*L*	*L*	*M*	*M*	*L*	*L*	*L*	*M*	*H*	*M*	*1*	*80*	*75*
CLO-4 :	*Learn the techniques of Employee motivation and engagement.*	*2*	*80*	*70*	*M*	*H*	*M*	*L*	*M*	*M*	*L*	*L*	*L*	*M*	*H*	*H*	*2*	*80*	*70*
CLO-5 :	*Implement, evaluate and control the process in an organization*	*3*	*90*	*80*	*M*	*H*	*H*	*L*	*M*	*M*	*L*	*L*	*L*	*M*	*H*	*L*	*3*	*90*	*80*
Overall	*Gain Knowledge in the field of HR to Plan, Organize, Coordinate and control the Human Resource*	*3*	*90*	*80*	*H*	*L*	*H*	*M*	*H*	*M*	*H*	*M*	*L*	*H*	*M*	*H*	*3*	*90*	*80*

Duration (hour)		**6**	**6**	**6**	**6**	**6**
S-1	SLO-1	*Introduction to Human Resource Management*	*Human Resource Planning*	*Definition of Training*	*Wage and salary administration objectives*	*Labour relations*
	SLO-2	*Importance of HRM*	*Objectives of HRP*	*Nature of Training*	*Principles of wage and salary administration*	*Employee security*
S-2	SLO-1	*Evolution of human resource management*	*HRP Process*	*Importance of Training*	*Components of Salary and wage administration*	*Industrial Relation*
	SLO-2	*Operative functions of HR*	*Manpower Estimation*	*Types of Training method*	*Methods of payments*	*Collective bargaining*
S-3	SLO-1	*Human Resource Era*	*Job analysis*	*Training process*	*Wage legislation in India*	*trade unionism*
	SLO-2	*Conceptual between Personnel Management and HRM*	*Job Description*	*Purpose and Benefits of Training*	*Incentives*	*Discipline administration*
S-4	SLO-1	*Strategic HRM*	*Job Specification*	*Career Planning - Definition & objectives*	*Benefits*	*Grievances handling*
	SLO-2	*Role of human resource manager*	*Sources of Recruitment*	*Process of career planning*	*Motivation – Meaning and definition*	*Managing dismissals and separation*
S-5	SLO-1	*Computer applications in human resource management*	*Selection Process*	*Benefits of career planning*	*Importance of motivation*	*Labour Welfare*
	SLO-2	*Challenges of the Human Factor*	*Placement*	*Problems in career planning*	*Theories of motivation*	*Importance & Implications of labour legislations*
S-6	SLO-1	*Human Factor-Inclusive growthHuman Factor - affirmative action*	*Induction Retention of Employees*	*Succession planning featuresScope of succession planning*	*Workers participation in management (WPM) Objectives Forms of WPM*	*Employee health , Safety Future of HRM function*
	SLO-2					

Learning Resources	1. *Dessler Human Resource Management, Pearson Education Limited, 14th Edition, 2015* 2. *Decenzo and Robbins, Fundamentals of Human Resource Management, Wiley, 11th Edition, 2013* 3. *Luis R.Gomez–Mejia, David B.Balkin, Robert L Cardy. Managing Human Resource. PHI Learning. 2012*	4. *Bernadin , Human Resource Management ,Tata Mcgraw Hill ,8th edition 2012. Wayne Cascio, Managing Human Resource, McGraw Hill, 2007.* 5. *Uday Kumar Haldar, Juthika Sarkar. Human Resource management. Oxford. 2012.* 6. *K.ASWATHAPPA – HUMAN RESOURCE MANAGEMENT – The McGraw- Hill Companies*

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*40%*	-	*30%*	-	*30%*	-	*30%*	-	*30%*	-
	Understand										
Level 2	Apply	*40%*	-	*40%*	-	*40%*	-	*40%*	-	*40%*	-
	Analyze										
Level 3	Evaluate	*20%*	-	*30%*	-	*30%*	-	*30%*	-	*30%*	-
	Create										
	Total	*100 %*		*100 %*		*100 %*		*100 %*		*100%*	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert from TCS	*Dr.K.Latha, Chandasekara University, Kanchipuram*	*Dr.N. SanthoshKumart, Head – Human Resources, SRMSOM*
	Dr.Thenmozhi, Professor, University of Madras	*Dr.S.Sujatha – Assistant Professor - SRMSOM*

Course Code	18CSC261T	Course Name	FORMAL LANGUAGE& AUTOMATA THEORY	Course Category	C	Professional Core	L	T	P	C
							3	0	0	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Engineering	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	Present various computing modelsfor formal language theory
CLR-2 :	Understand various language classification as specified by Chomsky
CLR-3 :	Utilize regular languages to represent lexical analyzer of compiler design
CLR-4 :	Understand how Context-Free grammar is used to represent programming constructs.
CLR-5 :	Analyze the use of Turing Machines and their applications in decidability theory
CLR-6 :	Represent a platform for higher level of Chomsky classification.

Course Learning Outcomes (CLO):	At the end of this course, learners will be able	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	To understand and design various Computing models like Finite State Machine, Pushdown Automata, and Turing Machine.	3	80	70	L	H	H	H	L	-	-	-	L	L	-	H	-	-	-
CLO-2 :	To understand the various types of grammar and the corresponding languages	3	85	75	L	H	L	M	M	-	-	-	L	L	-	H	-	-	-
CLO-3 :	To understand Decidability and Undecidability of various problems	3	75	70	L	H	M	H	L	-	-	-	M	L	-	L	-	-	-
CLO-4 :	To understand the computational complexity of various problems	3	85	80	M	H	M	H	M	-	-	-	H	L	-	H	-	-	-
CLO-5 :	To understand How compiler can be constructed with the help of formal models of computation theory?	3	85	75	H	H	M	H	L	-	-	-	M	L	-	M	-	-	-
CLO-6 :	Understand how formal language theory helps to understand Natural Language Processing	3	80	70	M	H	-	H	M	-	-	-	L	L	-	H	-	-	-

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Introduction- Alphabet, languages .	Context Free Grammars-	Pushdown Automata	Turing machines	Un-decidability and Decidability
	SLO-2	Grammars, productions and derivation	Examples	Example	Formal definition	Examples
S-2	SLO-1	Chomsky hierarchyof languages.	Various derivations-Leftmost, Right most. ambiguity	Deterministic Pushdown Automaton	Variants of Turing machines,	Church-Turing thesis
	SLO-2	Regular languages and finite automata	Context free languages- Relation between derivation and Derivation tree.	Non-Deterministic Push down automaton	Simple examples.	Proof
S-3	SLO-1	Regular languages and finite automata	Various Normal forms	Acceptance by emptying stack	Nondeterministic TMs and equivalence withdeterministic TMs	The diagonalization language L_d
	SLO-2	Deterministic finite automata (DFA)	Chomsky Normal form- Definition Useless symbol elimination	Acceptance by final state	Turing machine for palindromes, monus subtraction	L_d is not a recursively enumerable
S-4	SLO-1	Non-Deterministic finite automata (DFA)	An example	Equivalence of CFG to Pushdown automata	Turing machine for multiplication using subroutine copy.	The universal TM L_u
	SLO-2	Kleene's theorem	Unit production elimination-epsilon production elimination	An example	-Contd-	L_u construction
S-5	SLO-1	Equivalence of FA, regular expression and regular grammar	Chomsky normal form properties	Equivalence of PDA to CFG	Closure properties of Turing machines.	Lu is recursively enumerable but not recursive
	SLO-2	-Continued--	CFG to Chomsky normal form a complete example	An example	Computable function	Proof

S-6	SLO-1	*Pumping lemma for regular languages*	*-Continued-*	*Closure properties of CFL*	*Recursive language Recursively enumerable languages*	*Rice theorem*
	SLO-2	*Simple examples*	*Griebach Normal form definition.*	*Continued*	*Recursively enumerable languages*	*Un-decidable problems*
S-7	SLO-1	*Myhill-Nerode theorem*	*Rules to convert Griebach normal form*	*Context Sensitive Grammar*	*Turing machine codes*	*PCP Problem-Undecidable*
	SLO-2	*and its uses*	*Example*	*Context sensitive Language*	*Various examples*	*Complexity Classes-Using Deterministic and Non deterministic turing machines.*
S-8	SLO-1	*Myhill-Nerode theorem-An example*	*Pumping lemma for Context free grammar*	*Linear bounded automata*	*-Contd--*	*P-type, NP-Type problems*
	SLO-2	*Minimization of finite automata*	*Proof*	*An example*	*TM's as enumerators.*	*Examples*
S-9	SLO-1	*Table Filling algorithm*	*An example*	*Equivalence between linear bounded automata anf CSG*	*Unrestricted grammars and equivalence with Turing machines*	*NP-Complete, NP-Hard Problems*
	SLO-2	*An example*	*Continued*	*-Continued -*	*-Continued-*	*Examples.*

Learning Resources	*1. John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman,Introduction to Automata Theory, Languages, and Computation,Pearson; 3 edition (23 May 2008)* *2. Harry R. Lewis, Christos H. Papimitriou, Elements of the Theory of Computation,Pearson; 3 edition (23 May 2008)*	*3. Dexter C. Kozen, Automata and Computability,*Springer *2012.*

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*40%*	-	*30%*	-	*30%*	-	*30%*	-	*30%*	-
	Understand										
Level 2	Apply	*40%*	-	*40%*	-	*40%*	-	*40%*	-	*40%*	-
	Analyze										
Level 3	Evaluate	*20%*	-	*305%*	-	*305%*	-	*305%*	-	*305%*	-
	Create										
	Total	100 %		100 %		100 %		100 %		100%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert from TCS	*1. Dr. G.Venkiteswaran, Associate Professor,BITS Pilani,gvenki@pilani.bits-pilani.ac.in*	*1. Mr. K. Senthil Kumar*
	2.Dr. Masilamani V,Associate Professor, *IIITDM* ,masila@iiitdm.ac.in	

Course Code	18CSC262J	Course Name	COMPUTER ORGANIZATION &ARCHITECHTURE	Course Category	C	Professional Core	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	PCC-CS 402
Course Offering Department	Computer Science and Engineering	Data Book / Codes/Standards		Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	Utilize the functional units of a computer,analyzing the functions of arithmetic Units like adders, multipliers etc.
CLR-2 :	Study instruction set architecture and addressing modes .
CLR-3 :	Study of x86 archtecture,design of control unit and memory organization.
CLR-4 :	Analysis of Input output systems ,I/O transfers and I/O device interfaces
CLR-5 :	Study about parallel processing and understanding the concepts of Pipelining .
CLR-6 :	Identify different types of memory,mapping functions and replacement algorithms.

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcomes (PLO)													
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Identify the computer hardware and how software interacts with computer hardware	2	80	70	H	H	-	-	-	-	-	-	M	L	-	M	-	-	-
CLO-2 :	Demonstrate how to add and multiply integers and floating-point numbers using two's complement and IEEE floating point representation	3	85	75	H	H	H	-	H	-	-	-	M	L	-	M	-	-	-
CLO-3 :	Understand the principles and the implementation of computer arithmetic.	2	75	70	H	H	H	H	-	-	-	-	M	L	-	M	-	-	-
CLO-4 :	Program using x86 instruction sets.	3	85	80	H	-	-	H	-	-	-	-	M	L	-	M	-	-	-
CLO-5 :	Identify the memory technologies, input-output systems and evaluate the performance of memory system	3	85	75	H	-	H	H	-	-	-	-	M	L	-	M	-	-	-
CLO-6 :	State and compare properties of shared memory and distributed multiprocessor systems and cache coherency protocols.	3	85	75	H	H	H	H	H	-	-	-	M	L	-	M	-	-	-

Duration (hour)		15	15	15	15	15
S-1	SLO-1	Introduction to Boolean logic,	Integer addition and Subtraction	Introduction to 8086 architecture.	Input-output subsystems	Memory hiearchy
	SLO-2	Combinational Circuits-Adders,subtractors	Ripple carry adder,	Addressing modes of 8086	I/O deviceinterface	Memory inerleaving Higher order
S-2	SLO-1	Sequential circuits-Flip flops and its types.	Carry look ahead adder	Instruction sets of 8086	/O transfers – program controlled	Memory inerleaving lower order
	SLO-2	Functional Units of a computer ,Operational concepts Instruction sets, Addressing modes Addressing modes types	Signed operand multiplication-Booths multiplication	Instruction sets of 8086	interrupt driven	Cache memory-Mapping function
S-3	SLO-1	Operational concepts -RTL interpretation of instructions,	Bit pair recoding of multipliers	Assembler Directives	DMA	Replacement algorithms
	SLO-2	Addressing modes	Problem Solving	Problem solving	privilegedand non-privileged instructions,	Performance considerations
S4-5	SLO-1	Lab 1: To recognize various components of PC- Input Output systems Processing and Memory units	Lab4:Study of TASM Addition and Subtraction of 8-bit number	Lab-7: Design of Half Adder Design of Full Adder	Lab-10: Study of Array Multiplier Design of Array Multiplier	Lab-13: Study of Carry Save Multiplication Program to carry out Carry Save Multiplication
	SLO-2					
S-6	SLO-1	Addressing modes types	Carry save addition of summands	Hardwired control unit designMicro-programmed control-	software interrupts and exceptions	Hit rate and Miss penalty
	SLO-2	Problem solving	Integer division Restoring Non restoring	Micro-programmed control-	Role of Interrupts and process state transitions	Caches on processor chip
S-7	SLO-1	Instruction set.	Integer division Restoring Non restoring	Microinstruction ,Micro-program Sequencing	I/O device interfaces SCSI	Problem Solving

	SLO-2	*Data transfer,arithmetic instructions*	*Problem Solving*	*Micro-program Sequencing*	I/O device interfaces-USB	*Virtual Memory*
S-8	SLO-1	*Logical instructions*	*IEEE standard for floating point numbers*	*Micro instruction with Next address field*	Basic concepts of pipelining	*Address space and memory space*
	SLO-2	*Condtiional instructions*	*Problem Solving*	*Semiconductor RAM memorie*	*Arithmetic and instruction pipeline*	*Address mapping using pages*
S 9-10	SLO-1 SLO-2	*Lab-2:To understand how different components of PC are connected to work properly Assembling of System Components*	*Lab 5: Addition of 16-bit number Subtraction of 16-bit number*	*Lab-8: Study of Ripple Carry Adder Design of Ripple Carry Adder*	*Lab-11: Study of Booth Algorithm*	*Lab-14: Understanding Processing unit Design of primitive processing unit*
S-11	SLO-1	*Data representation*	*Guard bit and Truncation*	*Internal organization of memory chips*	*Inroduction to parallel processing*	*Memory protection*
	SLO-2	*Complements*	*Solving Problems*	*Static memories,AsynchronousDram,Synchronous DRAM*	*RISC processors*	*Memory management Requirements*
S-12	SLO-1	*Fixed point Representation,Integer,Arithmetic addition and subtraction*	*Implementing floating point operations*	*Read Only memories*	*CISC processors Comparision of RISC and CISC*	*Secondary storage*
	SLO-2	*Overflow,Decimal fixed poin representation*	*Solving Problems*	*ROM,PROMEPROM*	*Vector processing*	*Magnetic hard disks*
S-13	SLO-1	*Floating point represntation*	*Arithmetic operations on Floating point numbers*	*EEPROM,Flash memory*	*Array processing*	*Optical Disks*
	SLO-2	*Character representation*	*Solving Problems*	*Problem solving*	*Cache coherence protocols*	*MagneticTape systems*
S 14-15	SLO-1 SLO-2	*Lab -3To understand how different components of PC are connected to work properly Disassembling of System Components*	*Lab-6: Multiplication of 8-bit number Factorial of a given number*	*Lab-9: Study of Carry Look-ahead Adder Design of Carry Look-ahead Adder*	*Lab-12: Program to carry out Booth Algorithm*	*Lab-15: Understanding Pipeline concepts Design of basic pipeline.*

Learning Resources	1. *Computer System Architecture* M. M. Mano:, 3rd ed., Prentice Hall of India, New Delhi, 1993. 2. *Computer Organization and Design: The Hardware/Software Interface*, David A. Patterson and John L. Hennessy.	3. *Computer Organization and Embedded Systems*, Carl Hamacher.. 4. *Computer Architecture and Organization*, John P. Hayes

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
Level 2	Apply Analyze	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
Level 3	Evaluate Create	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Experts from TCS	*1. Prof. A.P. Shanthi, ANNA University Chennai, a.p.shanthi@cs.annauniv.edu*	*1.Dr. V. Ganapathy, SRMIST*
		2. Dr. C. Malathy, SRMIST
		3. MrsM.S.Abirami, SRMIST

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Course Code	18CSC263J	Course Name	OBJECT ORIENTED PROGRAMMING	Course Category	C	Professional Core	L	T	P	C
							2	0	4	4

Pre-requisite Courses	18CSC161J	Co-requisite Courses	Nil	Progressive Courses	18CSC268J
Course Offering Department	Computer Science and Engineering	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	Utilize the different data types and C concepts in applications
CLR-2 :	Utilize C++ Concepts in developing applications
CLR-3 :	Utilize member functions and error handling for real-time applications
CLR-4 :	Utilize Inheritance, Polymorphism applications
CLR-5 :	Utilize Generic Programming for real-time applications
CLR-6 :	Utilize the different types of UML operations for real-time programming applications

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning 1 Level of Thinking (Bloom)	Learning 2 Expected Proficiency (%)	Learning 3 Expected Attainment (%)	PLO 1 Engineering Knowledge	PLO 2 Problem Analysis	PLO 3 Design & Development	PLO 4 Analysis, Design, Research	PLO 5 Modern Tool Usage	PLO 6 Society & Culture	PLO 7 Environment & Sustainability	PLO 8 Ethics	PLO 9 Individual & Team Work	PLO 10 Communication	PLO 11 Project Mgt. & Finance	PLO 12 Life Long Learning	PLO 13 PSO - 1	PLO 14 PSO - 2	PLO 15 PSO – 3
CLO-1 :	Revise C Concepts. Create applications on command line arguments	3	80	70	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-
CLO-2 :	Create the different types of applications using C++ classes and objects	3	85	75	M	H	L	M	L	-	-	-	M	L	-	H	-	-	-
CLO-3 :	Create applications using constructors, destructors and friend classes	3	75	70	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-4 :	Implement Inheritance and polymorphism concepts	3	85	80	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-5 :	Create class and function templates	3	85	75	H	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-6 :	Construct UML diagrams for real-time applications	3	80	70	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-

Duration (hour)		18	18	18	18	18
S-1	SLO-1	Procedural programming, An Overview of C:Types Operator and Expressions, Scope and Lifetime, Constants	Some difference between C and C++: Single line comments	More extensions to C in C++ to provide OOP Facilities: Scope of Class	Essentials of Object-Oriented Programming: Operator Overloading	Generic Programming: Template concept
	SLO-2	Control Flow, Program Structure	Local variable declaration within function scope, function declaration	Scope Resolution Operator	Operator Overloading	class template, function template
S-2	SLO-1	Arrays, and References, Namespaces, Functions	function overloading	Member Function of a Class, private	Single Inheritance, Multiple Inheritance	function template
	SLO-2	Pointers	stronger type checking, Reference variable	protected and public Access Specifiers,protected and public Access Specifiers	Single Inheritance, Multiple Inheritance	template specialization
S 3-6	SLO-1	Lab 1: Implementation of Functions and pointers	Lab4:Implementation Function overloading	Lab 7:Implementation of Private, protected, public access specifiers	Lab10: Implementation of Operator overloading, Single and multiple inheritance	Lab 13: Implementation of Templates
	SLO-2					
S-7	SLO-1	error handling	parameter passing – value vs reference	this Keyword,	Class Hierarchy	Input and Output: Streams
	SLO-2	Input and Output	passing pointer by value or reference, Operator new and delete	this Keyword	Pointers to Objects	Streams, Files
S-8	SLO-1	Library Functions (string)	the typecasting operator, Inline Functions in contrast to macro	Constructors	Polymorphism through dynamic binding	Files, Library functions
	SLO-2	Library Functions (math, stdlib)	default arguments	Constructors	Assignment of an Object to another Object	formatted output

S 9-12	SLO-1	*Lab 2: Implementation of Library functions*	*Lab 5: Implementation parameter passing, Inline and default arguments*	*Lab 8: Implementation of Constructors and this keyword*	*Lab 11:Implementation of Pointers, polymorphism*	*Lab 14:Implementation of Files and formatted output*
	SLO-2					
S-13	SLO-1	*Command line arguments*	*The Fundamentals of Object-Oriented Programming: Necessity for OOP*	*Destructors*	*Overloading*	*UML Concept, use case for requirement capturing*
	SLO-2	*Command line arguments*	*Data Hiding, Data Abstraction*	*Friend class*	*Virtual Functions*	*Class diagram, Activity diagram*
S-14	SLO-1	*Preprocessor Directive*	*Encapsulation, Procedural Abstraction*	*error handling (exception)*	*overriding and hiding*	*Sequence Diagram for design*
	SLO-2	*Preprocessor Directive*	*Class and Object*	*error handling (exception)*	*Error Handling*	*Corresponding C++ code from design*
S 15-18	SLO-1	*Lab 3: Implementation of command line arguments, Preprocessor directive*	*Lab 6: Implementation of Classes and objects*	*Lab9: Implementation of error handling, Friend class, Destructors*	*Lab 12:Implementation of Error Handling, Overloading,Overriding, Virtual functions*	*Lab 15:Implementation UML concept*
	SLO-2					

Learning Resources	1. *The C++ Programming Language, Bjarne Stroustrup.* 2. *C++ and Object-Oriented Programming Paradigm, Debasish Jana*	3. *Programming – Principles and Practice Using C++, Bjarne Stroustrup.* 4. *The Design and Evolution of C++, Bjarne Stroustrup.*

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Understand										
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze										
Level 3	Evaluate	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Create										
	Total	100 %		100 %		100 %		100 %		100%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Experts from TCS	*1. Dr. Srinivasa Rao Bakshi, IITM, Chennai, sbakshi@iitm.ac.in*	*1. Dr.T.Y.J Naga Malleswari*
	2. Dr. Ramesh Babu, N , nrbabu@iitm.ac.in	
	3.Dr.Noor Mahammad, IIITDM, Kancheepuram,noor@iiitdm.ac.in	

Course Code	18CSC264J	Course Name	COMPUTATIONAL STATISTICS	Course Category	C	Professional Core	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	18CSC204J
Course Offering Department	Computer Science and Engineering	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	Utilize the different data handling techniques			
CLR-2 :	Utilize Regression methods			
CLR-3 :	Utilize clustering techniques for real-time applications			
CLR-4 :	Utilize various data sets for real-time applications			
CLR-5 :	Utilize algorithms to find optimal solutions to prediction problems			
CLR-6 :	Utilize the Python libraries to implement the techniques learnt in the course			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcomes (PLO)													
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO – 2	PSO – 3
CLO-1 :	Identify suitable algorithm to solve prediction problems	3	80	70	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-
CLO-2 :	Implement Regression methods	3	85	75	M	H	L	M	L	-	-	-	M	L	-	H	-	-	-
CLO-3 :	Implement clustering techniques	3	75	70	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-4 :	Implement statistical analysis on the data	3	85	80	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-5 :	Analyze various evaluation techniques	3	85	75	H	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-6 :	Strong foundation in Python	3	80	70	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-

Duration (hour)		15	15	15	15	15
S-1	SLO-1	Multivariate Normal Distribution: Multivariate Normal Distribution Functions	linear discriminant function analysis	Functions	Data Ranges	Congruential Methods
	SLO-2	Conditional Distribution	Estimating linear discriminant functions and their properties	Numeric Types	Frequencies	Other `Better?' Methods
S-2	SLO-1	Conditional Distribution and its relation to regression model	linear discriminant functions properties	Sequences	Shifting	Random Number Generation- other than Uniform
	SLO-2	Estimation of parameters	Principal components	Class Definition	Visualization in Python: Matplotlib package	Inversion Method
S-3	SLO-1	Standard multiple regression models	Algorithm for conducting principal component analysis	Text & Binary Files - Reading and Writing	Plotting Graphs	Rejection Methods
	SLO-2	Standard multiple regression models with emphasis on detection of collinearity	deciding on how many principal components to retain	Text & Binary Files – Writing	Adding Text	Table Lookup
S 4-5	SLO-1	Lab 1: Getting Started with Python	Lab4 : Implementation principal Component Analysis for finding Important texts in a Corpus	Lab 7 :Exercises on handling files	Lab10: Exercises Using Matplotlib	Lab 13: Implementation of Graph using Array
	SLO-2					
S-6	SLO-1	Outliers	Factor analysis model	Combining Datasets	More Graph Types	Specialized Methods
	SLO-2	non-normality	Extracting common factors	Merging Datasets	Getting values	Polar methods for the Normal
S-7	SLO-1	Autocorrelation	determining number of factors	Reshaping	Setting values	Importance Sampling
	SLO-2	Validation	Transformation of factor analysis solutions	Pivoting	EM algorithm	The bootstrap : the univariate context

S-8	SLO-1	*Validation of model assumptions*	*Factor scores*	*Data Transformation*	*Implementation*	*The Bootstrap, Permutation Tests,*
	SLO-2	*Assumptions of Multivariate Regression Models*	*Clustering and Segmentation Analysis: Introduction*	*String Manipulation*	*Estimating Mixture Proportions*	*Motivation*
S 9-10	SLO-1	*Lab 2: Prediction Exercises*	*Lab 5: Exercises on Factor Analysis*	*Regular Expressions Data Aggregation, Group Operations, Time series: Group By Mechanics*	*Lab 11: Implementing EM algorithms*	*Lab 14:Implementing Bootstrapping*
	SLO-2					
S-11	SLO-1	*Multivariate Regression Models*	*Types of clustering Correlations Distances*	*Data Aggregation*	*EM for exponential families*	*Simulation*
	SLO-2	*Assumptions of Multivariate Regression Models*	*clustering by partitioning methods*	*Groupwise Operations*	*Monte Carlo Simulations*	*S examples for simple bootstraps*
S-12	SLO-1	*Parameter estimation*	*K means*	*Transformations*	*Monte Carlo methods*	*Parametric bootstrap*
	SLO-2	*Multivariate Analysis of variance*	*Bayesian*	*Pivot Tables*	*Antithetic Resampling*	*Smoothed Bootstrap*
S-13	SLO-1	*Multivariate Analysis of covariance*	*Graph Clustering*	*Cross Tabulations*	*Importance Sampling*	*Quality of Estimates*
	SLO-2	*Statistical background*	*Spectral Clustering*	*Time Series Basics*	*Random Number Generation-Uniform[0, 1]*	*Enhancements Bootstrap-t : Studentizing*
S 14-15	SLO-1	*Lab 3: Performance Analysis of Regression Analysis*	*Lab 6: Clustering of Images and Text documents*	*Lab9: Exercises on Regular Expressions*	*Lab 12:Implementation of EM algorithm*	*Lab 15 :Implementation of Minimal Spanning Tree*
	SLO-2					

Learning Resources	1. *An Introduction to Multivariate Statistical Analysis,* T.W. Anderson. 2. *Applied Multivariate Data Analysis, Vol I & II,* J.D. Jobson. *3. Beginning Python: From Novice to Professional,* Magnus Lie Hetland. *Edition, 2005.* *4. The Foundations of Factor Analysis*, A.S. Mulaik.	5. *Introduction to Linear Regression Analysis*, D.C. Montgomery and E.A. Peck. 6. *Python for Data Analysis,* Wes Mc Kinney. *7. Programming Python,* Mark Lutz. *8. Python 3 for Absolute Beginners,* Tim Hall and J-P Stacey.

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Understand										
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze										
Level 3	Evaluate	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Create										
	Total	100 %		100 %		100 %		100 %		100%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Experts from TCS		*Dr.C.N.Subalalitha*

Course Code	18CSC265J	Course Name	SOFTWARE ENGINEERING	Course Category	C	Professional Core	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Engineering	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	Study the emergence of software engineering as a discipline
CLR-2 :	Study the effectiveness of Software Project Management
CLR-3 :	Understand the metrics and models of Software Quality and Reliability
CLR-4 :	Implement Software Requirements Analysis, Design and Construction
CLR-5 :	Understand the Object Oriented approach towards software development
CLR-6 :	Use the various Software Testing methods

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning 1 Level of Thinking (Bloom)	2 Expected Proficiency (%)	3 Expected Attainment (%)
CLO-1 :	Utilize engineering approach to software development	3	80	70
CLO-2 :	Practice the various software development life cycle models	3	85	75
CLO-3 :	Practice the software quality models	3	75	70
CLO-4 :	Analyze the techniques of requirement gathering and modelling	3	85	80
CLO-5 :	Implement Class Responsibility Collaborator model	3	85	75
CLO-6 :	Do effective white and black box testing coverage	3	80	70

Program Learning Outcomes (PLO)	1 Engineering Knowledge	2 Problem Analysis	3 Design & Development	4 Analysis, Design, Research	5 Modern Tool Usage	6 Society & Culture	7 Environment & Sustainability	8 Ethics	9 Individual & Team Work	10 Communication	11 Project Mgt. & Finance	12 Life Long Learning	13 PSO - 1	14 PSO - 2	15 PSO – 3
CLO-1 :	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-
CLO-2 :	M	H	L	M	L	-	-	-	M	L	-	H	-	-	-
CLO-3 :	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-4 :	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-5 :	H	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-6 :	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-

Duration (hour)		15	15	15	15	15
S-1	SLO-1	Programming in the small vs Programming in the large	Internal qualities	Software Requirements Analysis, Design and Construction	Object Oriented Analysis, Design and Construction	Software Testing
	SLO-2	software project failures	external qualities	Introduction to Software Requirements Specifications (SRS)	Object Oriented Concepts	Introduction to faults and failures
S-2	SLO-1	Importance of software quality and Timely availability	process quality	requirement elicitation techniques	the principles of abstraction	basic testing concepts
	SLO-2	Engineering approach to software development	product quality	techniques for requirement modeling	modularity	basic testing concepts
S-3	SLO-1	role ofsoftware engineering towards successful execution of large software projects	principles to achieve software quality	decision tables	specification, encapsulation	concepts of verification
	SLO-2	emergence of software engineering as a discipline	introduction to different software quality models	event tables	information hiding	concepts of validation
S 4-5	SLO-1	Lab1:Case study on Software engineering principles	Lab4:Software quality metrics	Lab7:Implementation of requirements gathering techniques	Lab10:Study on object oriented concepts	Lab13:Implementation of verification and validation procedures
	SLO-2					
S-6	SLO-1	Software Project Management	McCall	state transition tables	concepts of abstract data type	black box tests
	SLO-2	Basic concepts of life cycle models – different models and milestones	Boehm	Petri nets	Class Responsibility Collaborator (CRC) model	white box tests
S-7	SLO-1	software project planning –identification of activities and resources	FURPS	requirements documentation Template	quality of design	white box test coverage

	SLO-2	*concepts of feasibility study*	*FURPS+*	*Through use cases*	*design measurements*	*code coverage*
S-8	SLO-1	*techniques for estimation of schedule and effort*	*Dromey*	*introduction to UML*	*Design metrics*	*condition coverage*
	SLO-2	*software cost estimation models*	*ISO – 9126*	*introduction to softwaremetrics*	*concepts of design patterns*	*Branch coverage*
S z9-10	SLO-1 SLO-2	*Lab2:Implementation of lifecycle models*	*Lab5:Implementation of software quality models*	*Lab8: Implementation of requirements modelling methods*	*Lab11:Implementation of CRC model*	*Lab14:Implementation of White box testing*
S-11	SLO-1	*concepts of software engineering economics*	*introduction to Capability Maturity Models -CMM*	*metrics based control methods*	*concepts of design patterns*	*basic concepts of black-box tests – equivalence classes*
	SLO-2	*techniques of software project control and reporting*	*CMMI*	*metrics based control methods*	*Refactoring*	*boundary value tests*
S-12	SLO-1	*introduction to measurement of software size*	*introduction to software reliability*	*measures of code*	*object oriented construction principles*	*usage of state tables, testing use cases*
	SLO-2	*introduction to the concepts of risk and its mitigation*	*reliability models*	*measures of code*	*object oriented construction principles*	*transaction based testing*
S-13	SLO-1	*configuration management*	*reliability models and estimation*	*measures of design quality*	*object oriented metrics*	*testing for non-functional requirements – volume, performance and efficiency*
	SLO-2	*configuration management*	*Software estimation*	*measures of design quality*	*object oriented metrics*	*Concepts of inspection.*
S 14-15	SLO-1 SLO-2	*Lab3:Risk assessment tools and configuration management*	*Lab6:Implementation of Reliability models*	*Lab9:Usage of metrics of code and design quality*	*Lab12:Implementation of object oriented approach for software development*	*Lab15:Implementation of black box testing*

Learning Resources	1. *Software Engineering*, Ian Sommerville 2. *Object Oriented Software Engineering: A Use Case Driven Approach* --Ivar Jacobson 3. *Fundamentals of Software Engineering,* Carlo Ghezzi, Jazayeri Mehdi, Mandrioli Dino 4. *Software Requirements and Specification: A Lexicon of Practice, Principles and Prejudices*, Michael Jackson	5. *The Unified Development Process*, Ivar Jacobson, Grady Booch, James Rumbaugh 6. *Design Patterns: Elements of Object-Oriented Reusable Software*, Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides 7. *Software Metrics: A Rigorous and Practical Approach*, Norman E Fenton, Shari Lawrence Pfleeger

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
Level 2	Apply Analyze	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
Level 3	Evaluate Create	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Total	100 %		100 %		100 %		100 %		100%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Experts from TCS		*Mrs.K.RJansi*

Course Code	18PDM201L	Course Name	COMPETENCIES IN SOCIAL SKILLS	Course Category	M	Mandatory	L	T	P	C
							0	0	2	0

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Career Development Centre	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	enable students understand subtle meanings of words used in academic texts
CLR-2 :	determine the grammatical, syntactical, and logical accuracy of sentences
CLR-3 :	comprehend an argument's line of reasoning
CLR-4 :	understand the structure, organization, tone, and main idea behind the passage
CLR-5 :	recognize the logical coherence of ideas in a text
CLR-6 :	give the right knowledge, skill and aptitude to face any competitive examination

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning 1 Level of Thinking (Bloom)	Learning 2 Expected Proficiency (%)	Learning 3 Expected Attainment (%)
CLO-1 :	build vocabulary through methodical approaches and nurture passion for enriching vocabulary	3	80	75
CLO-2 :	detect and correct any grammatical, syntactical, and logical fallacies	2	80	75
CLO-3 :	hone critical thinking skills by analyzing arguments with explicit and implicit premises to validate the author's point of view	3	80	75
CLO-4 :	analyze and evaluate texts critically in multifarious ways	3	80	75
CLO-5 :	identification of relationships between sentences based on their function, usage and characteristics	2	80	75
CLO-6 :	ace competitive examinations	2	80	75

Program Learning Outcomes (PLO)	1 Engineering Knowledge	2 Problem Analysis	3 Design & Development	4 Analysis, Design, Research	5 Modern Tool Usage	6 Society & Culture	7 Environment & Sustainability	8 Ethics	9 Individual & Team Work	10 Communication	11 Project Mgt. & Finance	12 Life Long Learning	13 PSO - 1	14 PSO - 2	15 PSO – 3
CLO-1 :	L	H	-	M	-	-	-	-	M	H	-	H	-	-	-
CLO-2 :	L	H	-	M	-	-	-	-	M	H	-	H	-	-	-
CLO-3 :	L	H	-	M	-	-	-	-	M	H	-	H	-	-	-
CLO-4 :	L	H	-	M	-	-	-	-	M	H	-	H	-	-	-
CLO-5 :	L	H	-	M	-	-	-	-	M	H	-	H	-	-	-
CLO-6 :	L	H	-	M	-	-	-	-	M	H	-	H	-	-	-

Duration (hour)		6	6	6	6	6
S-1	SLO-1	Synonyms in Isolation and Context	Spotting Errors – Level I	Critical Reasoning – Weakening	Reading Comprehension – Main Idea	Para Jumble-Type I
	SLO-2	Practice	Practice	Practice	Practice	Practice
S-2	SLO-1	Antonyms in Isolation and Context	Spotting Errors – Level II	Critical Reasoning – Inference	Reading Comprehension – Tone	Para Jumble-Type II
	SLO-2	Practice	Practice	Practice	Practice	Practice
S-3	SLO-1	Common Confusables	Spotting Errors – Level II	Critical Reasoning – Conclusion	Reading Comprehension – Inference	Para Jumble-Type III
	SLO-2	Practice	Practice	Practice	Practice	Practice
S-4	SLO-1	Cloze Passage	Sentence Correction-Type I & II	Critical Reasoning - Explain the paradox	Reading Comprehension – Summary	Para Completion
	SLO-2	Practice	Practice	Practice	Practice	Practice
S-5	SLO-1	Word Analogy	Sentence Correction-Type III & IV	Critical Reasoning – Miscellaneous	Reading Comprehension – Conclusion	Para Completion
	SLO-2	Practice	Practice	Practice	Practice	Practice
S-6	SLO-1	Sentence Completion	Sentence Correction-Type V& VI	Critical Reasoning – Miscellaneous	Reading Comprehension – Miscellaneous	Para Summary
	SLO-2	Practice	Practice	Practice	Practice	Practice

Learning Resources	1. *Charles Harrington Elstor, Verbal Advantage: Ten Easy Steps to a Powerful Vocabulary, Random House Reference, 2002* 2. *Merriam Webster's Vocabulary Builder, Merriam Webster Mass Market, 2010* 3. *Norman Lewis, How to Read Better and Faster, Goyal, 4th Edition* 4. *Franklin GRE Word List, 3861 GRE Words, Franklin Vocab System, 2014* 5. *Wiley's GMAT Reading Comprehension Grail, Wiley, 2016*	6. *Manhattan Prep GRE : Reading Comprehension and Essays, 5th Edition* 7. *Martin Hewings, Advanced Grammar in Use. Cambridge University Press, 2013* 8. *Manhattan GMAT – Critical Reasoning, GMAT Strategy Guide, 12th Edition* 9. *Joern Meissner, Manhattan Review, GRE Analytical Writing Guide, Manhattan Review Inc, 2011* 10. *GRE Analytical Writing, Solutions to the Real Essay Topics (Test Prep. Series), Vibrant Publishers, 2011*

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (100% weightage)								Final Examination	
		CLA – 1 (20%)		CLA – 2 (30%)		CLA – 3 (30%)		CLA – 4 (20%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	-	*40%*	-	*30%*	-	*30%*	-	*30%*	-	-
	Understand										
Level 2	Apply	-	*40%*	-	*40%*	-	*40%*	-	*40%*	-	-
	Analyze										
Level 3	Evaluate	-	*20%*	-	*30%*	-	*30%*	-	*30%*	-	-
	Create										
	Total	100 %		100 %		100 %		100 %		-	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts	
1. Mr. Vijay Nayar, Director, Education Matters, vijayn@edumat.com	*1. Dr. Dinesh Khattar, Delhi University, dinesh.khattar31@gmail.com*	*1. Dr. M. Snehalatha, SRMIST*	*3. Dr. P. Madhusoodhanan, SRMIST*
2. Mr. Ajay Zenner, Career Launcher, ajay.z@careerlauncher.com	*2. Mr. Nishith Sinha, dueNorth India Academics LLP, nsinha.alexander@gmail.com*	*2. Mr Jayapragash J., SRMIST*	*4. Mr. Clement A, SRMIST*

Semester – IV

Course Code	18MBH261T	Course Name	INTRODUCTION TO INNOVATION, INTELLECTUAL PROPERTY RIGHTS, MANAGEMENT AND ENTREPRENEURSHIP	Course Category	*H*	*Humanities & Social Sciences*	L	T	P	C
							3	0	0	3

Pre-requisite Courses	*Nil*	Co-requisite Courses	*Nil*	Progressive Courses	
Course Offering Department	*Faculty of Management*	**Data Book / Codes/Standards**		Nil	

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	To Understand the Innovation – What it is and why it matters			
CLR-2 :	Examine the IP			
CLR-3 :	To know the need management practices			
CLR-4 :	To understand about entrepreneurship			
CLR-5 :	Learn the technique of Performance process in entrepreneurship			
CLR-6 :	Understand the trends in entrepreneurship`			

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	Apply the conceptual knowledge of innovation	2	60	50
CLO-2 :	Analyze the importance of IP	2	80	70
CLO-3 :	Analyze the training models and the management practices	1	80	75
CLO-4 :	Learn the techniques of entrepreneurship	2	80	70
CLO-5 :	Implement, evaluate and control the process of entrepreneurship	3	90	80
Overall	Gain Knowledge in the field of entrepreneurship and update with recent trends	3	90	80

Program Learning Outcomes (PLO)															
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
H	*M*	*H*	*M*	*L*	*M*	*M*	*M*	*L*	*M*	*H*	*L*			
L	*H*	*L*	*L*	*M*	*M*	*M*	*L*	*L*	*M*	*H*	*H*			
M	*H*	*L*	*L*	*M*	*M*	*L*	*L*	*L*	*M*	*H*	*M*			
M	*H*	*M*	*L*	*M*	*M*	*L*	*L*	*L*	*M*	*H*	*H*			
M	*H*	*H*	*L*	*M*	*M*	*L*	*L*	*L*	*M*	*H*	*L*			
H	L	H	M	H	M	H	M	L	H	M	H			

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Scope – types –innovation	What is IP?	Introduction to management	Introduction to entrepreneurship	Recent trends in entrepreneurship
	SLO-2	Process of innovation	Introduction to IP	Principles of management	Scope and importance of entrepreneurship	Importance of innovation
S-2	SLO-1	Different aspects of innovation	Importance of IP	Difference between management and administration	Prospects of entrepreneurship	Role of innovation in present scenario
	SLO-2	Forms of innovation	Role , scope of IP	Theories of management	Entrepreneurial ecosystem	Creativity and innovation - meaning
S-3	SLO-1	Innovation models	Kinds of intellectual property rights	Evolution of management	Entrepreneurship process	Popularity of creativity and innovation in modern world
	SLO-2		Property rights needs and importance	Importance of management practices	Kinds of entrepreneurship	Role and responsibilities of different entrepreneurs in present trends
S-4	SLO-1	Type of innovation models	Introduction to trademarks	Role of manager	Barriers in entrepreneurship process	Women entrepreneurship
	SLO-2		Trademarks and its importance	Difference between manager and a entrepreneur	Is entrepreneurs are made or born?	Role of women entrepreneurs
S-5	SLO-1	Innovation lifecycle	Registration procedure	Different forms of organization	Factors influencing entrepreneurship	Rural entrepreneurship
	SLO-2	Sources of innovation	Procedure for cancellation	Function of management	Entrepreneurship ecosystem	Role of rural entrepreneurship
S-6	SLO-1	Forms of innovation	Copyright –	Different components of a business	Process of entrepreneurship	Social entrepreneur

	SLO-2	Strategy in innovation	Registration of copyrights	human resource management	Entrepreneurial mindset	Role of social entrepreneurs
S-7	SLO-1	Steps in strategy formation	Applying for copyrights	Marketing management	Myths in entrepreneurship	Technology driven entrepreneurship
	SLO-2	Innovation and strategy in new format	Procedure for obtaining copy rights	Financial management	Idea generation to business - meaning	Impact of technology driven entrepreneurs
S-8	SLO-1	New strategy	Copy right protection	Operations management.	Sources of idea generation	family business
	SLO-2	Implementation of new strategy	Ways of getting a copy rights	Systems management.	Business plan	First generation entrepreneurs
S-9	SLO-1	Importance of innovation	Patents	General management process	Steps for business model canvas	Sustainability of family business
	SLO-2	Steps for developing strategy	Criteria for patentability	Importance of all management process	Importance of business plan.	Climate change and entrepreneurship.

Learning Resources	1. Managing Innovation – integrating technological, market and organizational change – Wiley India edition 2. Entrepreneurship – theory and practice – Raj Shankar Vijay Nicole. 3. Joe Tidd, John Bessant. Managing Innovation: Integrating Technological, Market and Organizational Change	4. Entrepreneurship – second edition – Rajeev Roy – Oxford University Press 5. *K.ASWATHAPPA – HUMAN RESOURCE MANAGEMENT – The McGraw- Hill Companies*

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	40%	-	30%	-	30%	-	30%	-	30%	-
	Understand										
Level 2	Apply	40%	-	40%	-	40%	-	40%	-	40%	-
	Analyze										
Level 3	Evaluate	20%	-	30%	-	30%	-	30%	-	30%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert from TCS	Dr.K.Latha, Chandasekara University, Kanchipuram	Dr.N. SanthoshKumar, Head – Human Resources, SRMSOM
	Dr.Thenmozhi, Professor, University of Madras	Dr.M.Chitra – Assistant Professor - SRMSOM

Course Code	18MBH465T	Course Name	MARKETING RESEARCH AND MARKETING MANAGEMENT	Course Category	H	Humanities & Social Sciences	L	T	P	C
							2	0	0	2

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	
Course Offering Department	Faculty of Management		Data Book / Codes/Standards	Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	Understand the fundamentals of Research and literature reviewing			
CLR-2 :	Differentiate sources of information and research approaches			
CLR-3 :	Do qualitative and quantitative research, sample, survey, design, develop, code data collection forms, data entry, screen and analyze			
CLR-4 :	Adopt different analytic techniques to report findings			
CLR-5 :	Practice research report writing and presentation			
CLR-6 :	Read, discuss, debate, comprehend and conclude cases			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:			
CLO-1 :	Understand basic marketing concepts	1	60	50
CLO-2 :	Comprehend the dynamics of marketing and analyze how its various components interact with each other in the real world	1	50	70
CLO-3 :	Leverage marketing concepts for effective decision making	2	80	75
CLO-4 :	Understand basic concepts and application of statistical tools in Marketing research	2	80	70
CLO-5 :	Understand basic marketing concepts	2	90	80

Program Learning Outcomes (PLO)														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
H	M	H	M	L	L	M	H	L	H	M	L	1	60	50
L	H	L	L	M	M	H	H	M	M	H	M	1	50	70
M	H	L	L	M	M	M	M	H	H	H	M	2	80	75
M	H	H	H	M	M	M	L	H	H	M	M	2	80	70
M	H	M	L	M	H	H	M	M	M	H	M	2	90	80

Duration (hour)		6	6	6	6	6
S-1	SLO-1	Marketing Concepts and Applications	Product Management	Pricing	Marketing Research	Internet Marketing, Introduction to Internet Marketing.
	SLO-2	Introduction to Marketing & Core Concepts	Product Life cycle concept	Promotion and Distribution Strategy	Introduction, Type of Market Research	1.Advertising 2.Word of mouth referrals 3.Passing Traffic
S-2	SLO-1	Marketing of Services	Product life cycle strategies	Policies & Practices	Scope, Objectives & Limitations	Benefits of Online Business, Brand awareness Ease of access Competitive advantage Effectiveness
	SLO-2	Importance of marketing in service sector	New Product development	Pricing Methods	Marketing Research Techniques	Channels, Self-regulation, Stages of planning, Mapping fundamental concepts of Marketing (7Ps, STP)
S-3	SLO-1	Marketing Planning & Environment	New Product development & strategy	State the nature of Quantitative research and its purpose Price determination Policies	Survey Questionnaire design & drafting	Developments and strategies, Strategy and Planning for Internet Marketing
	SLO-2	Elements of Marketing Mix Analyzing needs trends in Environment Macro, Economic Political, Technical & Social	Stages in New Product development	Marketing Communication	Survey Questionnaire design & drafting	Ineffective forms of digital marketing
S-4	SLO-1	Understanding the consumer	Product classification	The promotion mix	Media Research, Qualitative Research	Fundamental of business markets.

	SLO-2	Determinants of consumer behavior	Product decision	Advertising & Publicity	Data Analysis: Use of various statistical tools	Organizational buying process. Business buyer needs.
S-5	SLO-1	Factors influencing consumer behavior Market Segmentation	Product extension strategies Branding	5 M's of Advertising Management Marketing Channels	Descriptive & Inference Statistics Statistical Hypothesis Testing, Multivariate Analysis	Market and sales potential. Product in business markets. Price in business markets. Place in business markets.
	SLO-2					
S-6	SLO-1	Basis of segmentation, selection of segments, Market Segmentation strategies,	Branding strategies	Retailing	Discriminant Analysis, Cluster Analysis	Promotion in business markets. Relationship. Networks.
	SLO-2	Target Marketing, Product Positioning	Packaging	Marketing Communication, Advertising	Segmenting and Positioning, Factor Analysis	customer relationship management. Business to Business marketing strategy

Learning Resources	1. Marketing Management (Analysis, Planning, Implementation & Control) – Philip Kotler 2. Fundamentals of Marketing – William J. Stanton & Others 3. Marketing Management – V.S. Ramaswamy and S. Namakumari 4. Marketing Research – Rajendra Nargundkar 5. Market Research – G.C. Beri 6. Market Research, Concepts, & Cases – Cooper Schindler	7. Marketing Management – Rajan Saxena 8. Marketing Management – S.A. Sherlekar 9. Service Marketing – S.M. Zha 10. Journals – The IUP Journal of Marketing Management, Harvard Business Review 11. Research for Marketing Decisions by Paul Green, Donald, Tull 12. Business Statistics, A First Course, David M Levine at al, Pearson Publication

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	40%	-	30%	-	30%	-	30%	-	30%	-
	Understand										
Level 2	Apply	40%	-	40%	-	40%	-	40%	-	40%	-
	Analyze										
Level 3	Evaluate	20%	-	30%	-	30%	-	30%	-	30%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert from TCS	*Dr. N. Thamarai Selvan, Professor, DOMS, NIT, Trichy.*	*Dr.S.Senthilkumar Associate Professor,FOM/SRMIST*
	Dr. Maran, Professor and Director, Sairam School of Management Studies	*Dr. A.R.Krishanan Associate Professor,FOM/SRMIST*

Course Code	18MBH262J	Course Name	DESIGN THINKING	Course Category	H	Humanities & Social Sciences	L	T	P	C
							2	0	2	3

Pre-requisite Courses	NA	Co-requisite Courses	NA	Progressive Courses	NA
Course Offering Department	MBA	*Data Book / Codes/Standards*	NA		

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*
CLR-1 :	*Develop the skills, structures, and processes that generate value by driving valuable insights along the knowledge funnel.*
CLR-2 :	*Understand the well-known and new tools in the right context of the design thinking application*
CLR-3 :	*Examine how to visualize ideas, stories and prepare the organization for a new mindset*
CLR-4 :	*Classify systems thinking and digital transformation process.*
CLR-5 :	*Comprehend the applications of design thinking in politics & society, business, health & science and law.*

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	**Learning**			**Program Learning Outcomes (PLO)**													
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	1 Engineering Knowledge	2 Problem Analysis	3 Design & Development	4 Analysis, Design, Research	5 Modern Tool Usage	6 Society & Culture	7 Environment & Sustainability	8 Ethics	9 Individual & Team Work	10 Communication	11 Project Mgt. & Finance	12 Life Long Learning	13 PSO - 1	14 PSO - 2	15 PSO – 3
CLO-1 :	*Understand applying the skills, structures, and processes that generate value by driving valuable insights along the knowledge funnel.*	*2*	*60*	*50*	*H*	*M*	*H*	*M*	*L*	*M*	*M*	*M*	*L*	*M*	*H*	*L*	*2*	*60*	*50*
CLO-2 :	*Learned Analyzing the effectiveness of design thinking tools and able to suggest the appropriate tool.*	*4*	*80*	*70*	*L*	*H*	*L*	*L*	*M*	*M*	*M*	*L*	*L*	*M*	*H*	*H*	*4*	*80*	*70*
CLO-3 :	*Envisage ideas & stories and prepare the organization for a new mindset.*	*4*	*80*	*75*	*M*	*H*	*L*	*L*	*M*	*M*	*L*	*L*	*L*	*M*	*H*	*M*	*4*	*80*	*75*
CLO-4 :	*Gain knowledge on systems thinking and digital transformation process.*	*1*	*80*	*70*	*M*	*H*	*M*	*L*	*M*	*M*	*L*	*L*	*L*	*M*	*H*	*H*	*1*	*80*	*70*
CLO-5 :	*Appreciate the applications of design thinking in politics & society, business, health & Science and law.*	*5*	*90*	*80*	*M*	*H*	*H*	*L*	*M*	*M*	*L*	*L*	*L*	*M*	*H*	*L*	*5*	*90*	*80*
Overall	Gain Knowledge in the field of Design Thinking, Tools, Transform organizations, systems thinking and applications	*1*	*90*	*80*	*H*	*L*	*H*	*M*	*H*	*M*	*H*	*M*	*L*	*H*	*M*	*H*	*1*	*90*	*80*

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Recognize the importance of Design Thinking	Explanation on personas creation	Importance of prototype phase in design thinking	Introduction to testing phase	Expanding the politics of civic engagement
	SLO-2	Design thinking and business	Create personas in design phase	How to create prototype	Recognize the best practices of the testing phase	Managing Gridlocked Debates
S-2	SLO-1	Design thinking and product	Importance of problem statements	Examples on prototype	Define Functional work	Implementing a Strategic Technology Creativity in the Culinary Arts
	SLO-2	Design thinking process	Recognize the steps to create problem statements	Explanation on development of prototype	Recognize how design thinking can help in function work	Empathy as a means to innovate in a pharmaceutical company Visioning, listening and diagramming at a university
S 3-4	SLO-1	Activity Lab-I: Experimental activity on the products they like and dislike based on their experience	Activity Lab-I: Immersion activity by groups	Activity Lab-I: Six thinking hats game	Activity Lab-I: Story telling activity	Activity Lab-I: Reflection activity using Satori moments
	SLO-2					
S-5	SLO-1	Identify the steps in the Design thinking process	Define the problem statements	Combining immersion and persona creation to create prototype	Agile thinking definition	Fast-Fail and Iterative
	SLO-2	Explanation of Stanford Model	Define the key problem statements	Defining problem statement and ideating to create prototypes	Define customer perception and expectations	Dinner conversation as a model for effective interviews

S-6	SLO-1	Steps in empathize phase of design thinking	Recognize the steps in the ideate phase of Design thinking	Define service value proposition	Define Product and customer satisfaction	Health care delivery
	SLO-2	Explanation on target activity	Idea on Six thinking hats	Create a value proposition statement	How design thinking and agile thinking complement each other to customer satisfaction	Design approach to treating cancer
S 7-8	SLO-1 SLO-2	Activity Lab-II: Target activity related to empathy	Activity Lab-II: Creating person a based on the immersion activity using A4 pages	Activity Lab-II: Million dollar idea game	Activity Lab-II: Activity on prototyping	Activity Lab-II: Apply design thinking to create a prototype to improve any existing product or service
S-9	SLO-1	Steps in immersion activity	Recognize how decoding can help to express ideas	Visualization of the personnel	Learn the elements of systems thinking, Actual level and desired level	Problem definition
	SLO-2	Explanation on Moccasin walk	Learn doodle	Understand Lean AEIOU	Review, gap and corrective action	Alternatives and the big idea
S-10	SLO-1	Steps in immersion activity	Importance of Story telling	Know what is problem space	Working of systems thinking & mindset of a system thinker	Draft as prototype
	SLO-2	Flow charts and handouts	Importance of presenting ideas	Know what is solution space	Differentiate system thinking and design thinking	Writing prose for writing pros
S 11-12	SLO-1 SLO-2	Activity Lab-III: Moccasin walk activity on stepping in to the shoes of another person	Activity Lab-III: Peer review activity	Activity Lab-III: Activity on doodling	Activity Lab-III: Test the prototype	Activity Lab-III: Groups need to complete all phases of Stanford design thinking model

Learning Resources

1. Nir Eyal - "Hooked by" – URL https://www.youtube.com/watch?v=iw1x0zos8Jo
2. Rod Judkins (2015) – "The Art of Creative Thinking" - Hachette Book Publishing
3. Dan Senor and Saul singer (2011) – "Start-up Nation" - Twelve; Reprint edition
4. Simon Sinek – "Start with why" – URL https://www.youtube.com/watch?v=u4ZoJKF_VuA
5. Claude Diderich (2020) – "Design Thinking for Strategy Innovation Towards Competitive Advantage" – Springer International Publishing
6. Kausik Kumar, DivyaZindani and J.PauloDavim (2020) – "Design Thinking to Digital Thinking" – Springer International Publishing
7. Michael Lewrick, Patrick Link and Larry Liefer (2018) – "The Design Thinking Playbook: Mindful Digital Transformation of Teams, Products, Services, Businesses and Ecosystems" – Wiley
8. Andrew Pressman (2018) – "Design Thinking: A Guide to Creative Problem Solving for Everyone"–Routledge
9. Walter Brenner and Falk Uebernickel (2016) – "Design thinking for Innovation: Research and Practice" – Springer International Publishing
10. (2015) - "The Field Guide to Human Centered Design" – IDEO.org – First Edition
11. Roger L Martin (2009) – "The Design of Business: Why Design Thinking is the Next Competitive Advantage" – Harward Business School Press

Web References

12. What is Design Thinking? Interaction Design Foundation
13. What are some of the good examples of design thinking? - Quora
14. Design thinking 101: Principles, Tools & Examples to transform your creative process

Online Resources

15. Understanding Design thinking WF NEN
16. Design Thinking and Innovation at Apple Wei Li
17. Stanford Webinar- Design Thinking = Method, Not Magic
18. Stanford Design Thinking Virtual Crash Course
19. So Many Uses- activity to spark creativity and design

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
Level 2	Apply Analyze	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
Level 3	Evaluate Create	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*

	Total	100 %	100 %	100 %	100 %	100 %

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert from TCS	Dr.Hansa Lysander Manohar, Professor, School of Management, Anna University Chennai	Dr..V.M.Shenbagaraman, Professor & HOD – SRMSOM
	Dr.Thenmozhi, Professor, University of Madras	Dr.P.Saravanan – Associate Professor & Head – Systems , SRMSOM

Course Code	18MAB261J	Course Name	OPERATIONS RESEARCH	Course Category	B	*Basic Sciences*	L	T	P	C
							2	0	2	3

Pre-requisite Courses	*18MAB161T*	Co-requisite Courses	*Nil*	Progressive Courses	*Nil*
Course Offering Department	*Mathematics*	Data Book / Codes/Standards	*Nil*		

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*	**Learning**		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	Apply basic concepts of Linear programming problems to solve engineering problems			
CLR-2 :	Appropriately choose, Transport and assignment problems and various solution methods for distinct situations			
CLR-3 :	To comprehend the fundamentals of project scheduling techniques			
CLR-4 :	Understand the EOQ, POQ models and sensitivity analysis			
CLR-5 :	Learn the concept of QUEUEING models and its applications in scheduling and Inventory systems			
CLR-6 :	Acquire the knowledge of Linear programming, Transportation /Assignment models, project scheduling techniques, inventory control and queuing models with its applications			

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Program Learning Outcomes (PLO)														
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
					Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Obtain the knowledge of Linear programming and using it to get optimal solutions for different real life situations of optimization	2	85	80	M	H	L						M	L		H			
CLO-2 :	Pertain the idea of transportation/assignment problems and its applications using different methods	2	85	80	M	H		M	M				M			H			
CLO-3 :	Acquire the knowledge of project scheduling techniques	2	85	80	M	H							M			H			
CLO-4 :	Understand the concept of inventory control and EOQ under probabilistic situations	2	85	80	M	H		M					M			H			
CLO-5 :	Gain familiarity in Queuing models and simulation methods	2	85	80	M	H	L						M	L		H			
CLO-6 :	Able to solve optimization and queuing models using simulation technique	2			M	H							M			H			

		Learning Unit / Module 1	**Learning Unit / Module 2**	**Learning Unit / Module 3**	**Learning Unit / Module 4**	**Learning Unit / Module 5**
Duration (hour)		**12**	**12**	**12**	**12**	**12**
S-1	SLO-1	Linear programming – Examples from industrial cases, formulation & definitions, Matrix form. Implicit assumptions of LPP	TP - Examples, Definitions – decision variables, supply & demand constraints, formulation, Balanced & unbalanced situations	Project scheduling -Basic definition.	Functions of inventory and its disadvantages, ABC analysis	Definitions – queue (waiting line), waiting costs, characteristics (arrival, queue, service discipline) of queueing system, queue types (channel vs. phase) Poisson's Process & queue
	SLO-2	Some basic concepts and results of linear algebra – Vectors, Matrices, Linear Independence / Dependence of vectors	Solution methods – NWCR	Project scheduling techniques – Gantt chart	Concept of inventory costs, Basics of inventory policy (order, lead time, types)	Kendall's notation, Little's law, steady state behaviour
S-2	SLO-1	Rank, Basis, System of linear equations, Hyper plane, Convex set, Convex polyhedron, Extreme points, Basic feasible solutions	Minimum cost method	Project Evaluation Review Technique (PERT)	Fixed order-quantity models – EOQ	M/M/1 and its performance measures; brief description about some special models
	SLO-2	Rank, Basis, System of linear equations, Hyper plane, Convex set, Convex polyhedron, Extreme points, Basic feasible solutions	Minimum cost method	Project Evaluation Review Technique (PERT)	Fixed order-quantity models – EOQ	M/M/1 and its performance measures; brief description about some special models
	SLO-1					

S-3 – S -4	SLO-2	To solve Linear Programming Practice using work sheet to solve Graphical Method with (i) Unbounded solution (ii) Infeasible solution (iii) Alternative or multiple solutions.	Practice using work sheet to solve transportation problems.	Practice using work sheet to perform Project scheduling of a given project (Deterministic case-PERT).	Practice using work sheet to solve Problems based on selective inventory classification (ABC analysis).	Practice using work sheet to determine the performance measures for M/M/1 queueing model.
S-5	SLO-1	Geometric method: 2-variable case, Special cases – infeasibility, unboundedness, redundancy &degeneracy	VAM, test for optimality (MODI method)	Critical path method (CPM)	POQ & Quantity discount models	M/M/m and its performance measures; brief description about some special models
	SLO-2	Geometric method: 2-variable case, Special cases – infeasibility, unboundedness, redundancy &degeneracy	VAM, test for optimality (MODI method)	Critical path method (CPM)	EOQ models for discrete units	M/M/m and its performance measures; brief description about some special models
S-6	SLO-1	Simplex Algorithm – slack, surplus & artificial variables, computational details	Degeneracy and its resolution	Determination of critical paths	Sensitivity analysis and Robustness	Definition and steps of simulation, random number, random number generator
	SLO-2	Big-M method, identification and resolution of special cases through simplex iterations	Degeneracy and its resolution	Determination of critical paths	Sensitivity analysis and Robustness	Definition and steps of simulation, random number, random number generator
S-7 - S-8	SLO-1	Practice using work sheet to find Solution of LPP with simplex method using statistical OR or statistical packages	Practice using work sheet to solve assignment problem	Practice using work sheet to perform Project scheduling of a given project (Probabilistic case-CPM).	Practice using work sheet to find optimal inventory policy for EOQ model.	Practice using work sheet to determine the performance measures for M/M/1/N queueing model
	SLO-2					
S-9	SLO-1	Duality – formulation and results, fundamental theorem of duality	AP - Examples, Definitions – decision variables, constraints, formulation Balanced &unbalanced situations	Estimation of Project time and its variance in PERT using statistical principles	Special cases of EOQ models for safety stock with known/unknown stock out situations	Discrete Event System Simulation – clock, event list
	SLO-2	Dual-simplex and Primal-dual algorithms	Balanced &unbalanced situations	Concept of project crashing/time-cost trade-off	Special cases of EOQ models for safety stock with known/unknown stock out situations	Discrete Event System Simulation – clock, event list
S-10	SLO-1	Sensitivity analysis	Solution method – Hungarian, test for optimality (MODI method)	Concept of project crashing/time-cost trade-off	Models under prescribed policy	Application in Scheduling
	SLO-2	Sensitivity analysis	Solution method – Hungarian, test for optimality (MODI method) Degeneracy & its resolution	Concept of project crashing/time-cost trade-off	Models under prescribed policy	Application in Queueing systems and Inventory systems
S-11 - S-12	SLO-1	Practice using work sheet to solve Charnes-M method problem solving using OR/statistical packages. Dual Simplex method -Problem solving using OR/statistical packages.	Practice using work sheet to solve travelling salesman problems.	Practice using work sheet to perform Project scheduling of a given project (Probabilistic case-PERT) with crashing.	Practice using work sheet to find optimal inventory policy for Probabilistic inventory model with discrete demand	Practice using work sheet measures for M/M/C/∞ queueing model
	SLO-2					

Learning Resources	1. *Operations Research: An Introduction.H.A. Taha* 2. *Linear Programming. K.G. Murthy* 3. *Linear Programming. G. Hadley* 4. *Principles of OR with Application to Managerial Decisions. H.M. Wagner* 5. *Introduction to Operations Research. F.S. Hiller and G.J. Lieberman.*	6. *Elements of Queueing Theory. Thomas L. Saaty* 7. *Operations Research and Management Science, Hand Book: Edited By A. Ravi Ravindran* 8. *Management Guide to PERT/CPM. Wiest& Levy* 9. *Modern Inventory Management. J.W. Prichard and R.H. Eagle* 10. *Wayne L. Winston and M. Venkataramanan: Introduction to Mathematical Programming: Applications and Algorithms, 4th edition, Duxbury Press, 2002.*

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Understand										
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze										
Level 3	Evaluate	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert from TCS	*1. Dr.K.C.Sivakumar, IIT, Madras, kcskumar@iitm.ac.in*	*1. Dr.A.Govindarajan, hod.maths.ktr@srmist.edu.in*
		2. Dr.N.Parvathi, parvathn@srmist.edu.in

Course Code	18CSC266J	Course Name	OPERATING SYSTEMS	Course Category	C	Professional Core	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Engineering	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	Understand the structure, function and services of Operating systems			
CLR-2 :	Learn about the process and threads			
CLR-3 :	Learn the UNIX OS file system and its services			
CLR-4 :	Understand the importance and principles of schedulers in operating system			
CLR-5 :	Learn the concurrency problem and its solutions			
CLR-6 :	Understand the different memory management schemes			
CLR -7 :	Learn the Input, Output and file management paradigms used by operating system			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcomes (PLO)													
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Create process and threads using system commands	3	80	70	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-
CLO-2 :	Execute UNIX OS file commands	3	85	75	M	H	L	M	L	-	-	-	M	L	-	H	-	-	-
CLO-3 :	Implement pre-emptive and Non pre-emptive schedulers	3	75	70	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-4 :	Implement mutual exclusion using semaphores to avoid concurrency problems	3	85	80	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-5 :	Implement algorithms of various memory management schemes	3	85	75	H	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-6 :	Implement algorithms used for disk scheduling	3	80	70	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-

Duration (hour)		15	15	15	15	15
S-1	SLO-1	Concept of Operating Systems (OS), Generations of OS	Foundation and Scheduling objectives	Concurrent processes, precedence graphs,Critical Section, Race Conditions	Basic concept of memory management	I/O devices and Device controllers
	SLO-2	Types of OS, OS Services	Types of Schedulers	Mutual Exclusion,Hardware Solution	Logical and Physical address maps	Direct Memory Access and Principles of I/O
S-2	SLO-1	Interrupt handling	Schedulingcriteria: CPU utilization, Throughput, Turnaround Time	Semaphores, Strict Alternation	Memoryallocation: Contiguous Memory allocation	Concept of File, Access methods
	SLO-2	System Calls and its types	Waiting Time, Response Time	Peterson's Solution	Fixed and variable partition	File types and File operations
S-3	SLO-1	Basic architectural concepts of an OS	Pre-emptive and non-pre-emptive scheduling	The Producer/ Consumer Problem, Event Counters	Internal and External fragmentation	Directory structure
	SLO-2	Concept of Virtual Machine	FCFS	Monitors, Message Passing	Compaction	File System structure
S 4-5	SLO-1 / SLO-2	Lab 1: Study of system calls , services and its commands	Lab4 :Implementation of FCFS scheduling	Lab 7 :Implementation of producer consumer problem	Lab10: Implementation of memory partitioning, fragmentation and compaction	Lab 13: Simulation of file organization techniques using single directory and hierarchical structure.
S-6	SLO-1	Resource Manager view	SJF	Classical IPC Problems: Reader's & Writer Problem,	Basics of Virtual Memory	Allocation methods (contiguous, linked, indexed)
	SLO-2	Process view and hierarchical view of an OS	RR	Dinning Philosopher Problem,Barber's shop problem	Hardware and control structures	Free-space management (bit vector, linked list, grouping)
S-7	SLO-1	Process: Definition, Process Relationship	Multiprocessor scheduling	Necessary and sufficient conditions for Deadlock	Localityof reference	Directory implementation(linear list, hash table)

	SLO-2	*Different states of a Process*	*Real Time scheduling*	*DeadlockPrevention, and Deadlock Avoidance*	*Page allocation*	*Efficiency and performance*
S-8	SLO-1	*Process Statetransitions*	*RM*	*Banker's algorithm*	*Partitioning*	*Disk structure*
	SLO-2	*Process Control Block (PCB)*	*EDF*	*Deadlock detection and Recovery*	*Paging and Page fault*	*Disk scheduling – FCFS*
S 9-10	SLO-1	*Lab 2: Implementation of new process creation and its communications*	*Lab 5: Implementation of SJF and RR Scheduling*	*Lab 8: Implementation of Banker's algorithm for Deadlock avoidance*	*Lab 11: Implementation of paging and calculation of page fault*	*Lab 14:Implementation of Disk scheduling algorithm - FCFS*
	SLO-2					
S-11	SLO-1	*Context switching*	*Case study: UNIX OS file system*	*Concurrent Programming:Critical region*	*Working Set, Segmentation, Demandpaging*	*SSTF*
	SLO-2	*Threads: Definition*	*Shell*	*conditional critical region*	*PageReplacement algorithms: Optimal*	*SCAN*
S-12	SLO-1	*Various states of threads*	*Filters*	*Monitors*	*First in First Out (FIFO)*	*C-SCAN*
	SLO-2	*Benefits of threads*	*Shell programming*	*Concurrent languages*	*Second Chance (SC)*	*Disk reliability*
S-13	SLO-1	*Types of threads*	*Programming with the standard I/O*	*Communicating sequential process (CSP)*	*Notrecently used (NRU)*	*Disk formatting*
	SLO-2	*Concept ofmultithreads*	*UNIX system calls*	*Deadlocks - prevention, avoidance, detection and recovery*	*Least Recently used (LRU)*	*Boot-block and Bad blocks*
S 14-15	SLO-1	*Lab 3: Implement of thread creation and deletion*	*Lab 6: Implementation of Unix Commands*	*Lab9: Applications of concurrent programming*	*Lab 12:Implementation of page replacement algorithms – FIFO and LRU*	*Lab 15 :Implementation of Disk scheduling algorithm – SSTF and SCAN*
	SLO-2					

Learning Resources	1. *Operating System Concepts Essentials.AbrahamSilberschatz, Peter Baer Galvin and Greg Gagne.* 2. *Operating Systems: Internals and Design Principles. William Stallings.* 3. *Operating System: A Design-oriented Approach. Charles Patrick Crowley.*	4. *Operating Systems: A Modern Perspective. Gary J. Nutt.* 5. *Design of the UNIX Operating Systems. Maurice J. Bach.* 6. *Understanding the Linux Kernel, Daniel Pierre Bovet, Marco Cesati*

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Understand										
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze										
Level 3	Evaluate	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Create										
	Total	100 %		100 %		100 %		100 %		100%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Experts from TCS		*1. Ms.A.Jackulin Mahariba, SRMIST, Kattankulathur*

Course Code	18CSC267J	Course Name	DATABASE MANAGEMENT SYSTEMS	Course Category	C	Professional Core	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Engineering	Data Book / Codes/Standards		Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	Understand the fundamentals of Database Management Systems, Architecture and Languages
CLR-2 :	Conceive the database design process through ER Model and Relational Model
CLR-3 :	Design Logical Database Schema and mapping it to implementation level schema through Database Language Features
CLR-4 :	Familiarize queries using Structure Query Language (SQL) and PL/SQL
CLR-5 :	Familiarize the Improvement of the database design using normalization criteria and optimize queries
CLR-6 :	Understand the practical problems of concurrency control and gain knowledge about failures and recovery

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning 1 Level of Thinking (Bloom)	Learning 2 Expected Proficiency (%)	Learning 3 Expected Attainment (%)	PLO 1 Engineering Knowledge	PLO 2 Problem Analysis	PLO 3 Design & Development	PLO 4 Analysis, Design, Research	PLO 5 Modern Tool Usage	PLO 6 Society & Culture	PLO 7 Environment & Sustainability	PLO 8 Ethics	PLO 9 Individual & Team Work	PLO 10 Communication	PLO 11 Project Mgt. & Finance	PLO 12 Life Long Learning	PSO 1	PSO 2	PSO 3
CLO-1 :	Acquire the knowledge on DBMS Architecture and Languages	3	80	70	H	M	L	L	-	-	-	-	L	L	L	H	-	-	-
CLO-2 :	Apply the fundamentals of data models to model an application's data requirements using conceptual modeling tools like ER diagrams	3	85	75	H	H	H	H	H	-	-	-	H	H	H	H	-	-	-
CLO-3 :	Apply the method to convert the ER model to a database schemas based on the conceptual relational model	3	75	70	H	H	H	H	H	-	-	-	H	H	H	H	-	-	-
CLO-4 :	Apply the knowledge to create, store and retrieve data using Structure Query Language (SQL) and PL/SQL	3	85	80	H	H	H	H	H	-	-	-	H	H	H	H	-	-	-
CLO-5 :	Apply the knowledge to improve database design using various normalization criteria and optimize queries	3	85	75	H	H	L	M	L	-	-	-	M	M	M	L	-	-	-
CLO-6 :	Appreciate the fundamental concepts of transaction processing- concurrency control techniques and recovery procedures.	3	80	70	H	L	L	L	L	-	-	-	H	L	L	L			

Duration (hour)		15	15	15	15	15
S-1	SLO-1	Introduction : Introduction to data, database, database management system	Relational Algebra : Relational algebra operations	Relational database design : Introduction	Query processing and optimization : Introduction	Transaction Management : ACID Property
	SLO-2					
S-2	SLO-1	Hierarchical and Network models	Tuple relational Calculus	Domain and data dependency	Evaluation of relational algebra expressions	Serializability
	SLO-2	Relational Model	Domain Relational Calculus			
S-3	SLO-1	Database system Architecture: Data abstraction	SQL: DDL and DML Constructs	Armstrong's axioms	Query equivalence	Locking based and Time stamp based scheduling
	SLO-2					
S 4-5	SLO-1	Lab 1: SQL Data Definition Language Commands on sample exercise	Lab 4 : Inbuilt functions in SQL on sample Exercise.	Lab 7: Join Queries on sample exercise.	Lab10: PL/SQL Procedures on sample exercise	Lab 13: PL/SQL Exception Handling
	SLO-2					
S-6	SLO-1	Data Independence	SQL Queries	Functional Dependencies	Join strategies	Multi-version and optimistic Concurrency Control schemes
	SLO-2					
S-7	SLO-1	Data Definition Language	SQL, Operators and functions	Normal forms: First Normal form	Query optimization	Database recovery
	SLO-2			Second Normal form		
S-8	SLO-1	Data Manipulation Language	SQL Joins	Third normal form and Boyce Code Normal Form	Query optimization algorithms	Database Security: Authentication
	SLO-2		Sub Queries	Other Normal forms		Authorization and access control
	SLO-1			Lab 8: Set Operators & Views	Lab 11: PL/SQL Functions	Lab 14: PL/SQL Trigger

S 9-10	*SLO-2*	*Lab 2: SQL Data Manipulation Language Commands*	*Lab 5: Construct a ER Model for the application to be constructed to a Database*			
S-11	*SLO-1*	*Data Models: Entity Relationship model*	*Open source and Commercial DBMS*	*Closure of attributes*	*Storage strategies : Types of storage*	*DAC, MAC and RBAC models*
	SLO-2	*Attributes, Keys, Relationships*		*Closure of functional dependency*		
S-12	*SLO-1*	*Integrity Constraints*	*MYSQL,ORACLE, DB2, SQL server*	*Dependency preservation*	*Indices*	*Intrusion detection, SQL injection*
	SLO-2	*ER Diagram*			*B tree Indexing*	
S-13	*SLO-1*	*Network and Relational data models*	*PL/SQL: Introduction to PL/SQL, Cursors, Triggers*	*Lossless design*	*Hashing*	*Introduction to advanced topics : Object oriented and Object relational databases, Logical databases*
	SLO-2	*Object oriented data models*			*Hashing techniques*	*Web databases, Distributed databases, Data warehousing and data mining*
S 14-15	*SLO-1*	*Lab 3: SQL Data Control Language Commands and Transaction control commands to the sample exercises*	*Lab 6: Nested Queries on sample exercises*	*Lab9: PL/SQL Conditional and Iterative Statement*	*Lab 12: PL/SQL Cursors*	*Lab 15 : Mini Project Review*
	SLO-2					

Learning Resources	1. *Abraham Silberschatz, Henry F. Korth, S. Sudharshan, Database System Concepts*ll*, Sixth Edition, Tata McGraw Hill,2011.* 2. *Jeffrey D. Ullman, Principles of Database Systems, Third Edition, Galgotia Publications Pvt. Ltd, 2008* 3. *RamezElmasri, Shamkant B. Navathe, Fundamentals of Database Systems*ll*, Sixth Edition, Pearson Education,2011.* 4. *Serge Abiteboul, Richard Hull, VictorVianu, Foundations of Databases, Pearson, 1994* 5. *CJ Date,AKannan,SSwamynathan, An Introduction to Database Systems, Eight Edition, Pearson Education,2006.*

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Understand										
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze										
Level 3	Evaluate	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Create										
	Total	100 %		100 %		100 %		100 %		100%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
*1.*Experts from TCS		*1. Dr.E.Poovammal, SRMIST*
		2. Mr.M.Eliazer, SRMIST

Course Code	18CSC268J	Course Name	SOFTWARE DESIGN WITH UML	Course Category	C	Professional Core	L	T	P	C
							2	0	2	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Engineering	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	Utilize the software process model and select a suitable modeling method according to problem area and assignment, and can justify their choice			
CLR-2 :	Utilize UML languages and its standards			
CLR-3 :	Utilize use case diagram and relationships			
CLR-4 :	Utilize sequence and collaboration diagrams			
CLR-5 :	Utilize class diagram model			
CLR-6 :	Utilize deployment models and model the software system and analyze its characteristics and correctness			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Identify the characteristics of quality software	1	80	70	H	H	H	H	M	M	M	M	M	H	L	H	H	H	H
CLO-2 :	Create different types of software development process models	2	85	75	H	H	H	H	M	M	M	M	M	H	L	H	H	H	H
CLO-3 :	Construct use case diagrams for real world applications and analyze the system requirements	2	75	70	H	H	H	H	M	M	M	M	M	H	L	H	H	H	H
CLO-4 :	Create sequence and collaboration diagram for finding objects of the process involved	2	85	80	H	H	H	H	M	M	M	M	M	H	L	H	H	H	H
CLO-5 :	Create class diagrams and analyze the characteristics and correctness of software system	2	85	75	H	H	H	H	M	M	M	M	M	H	L	H	H	H	H
CLO-6 :	Implement the appropriate modeling method for the given problem	3	80	70	H	H	H	H	M	M	M	M	M	H	L	H	H	H	H

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Introduction to on Object Oriented Technologies	Introduction to the UML Language.	Requirements Analysis Using Case Modeling	Transfer from Analysis to Design in the Characterization Stage	The Logical View Design Stage
	SLO-2	Introduction to UML Methods and software process.	Standards.	Analysis of system requirements.	Interaction Diagrams.	Logical architecture view
S-2	SLO-1	Software development process: The Waterfall Model vs. The Spiral Model.	Elements of the language.	Actor definitions.	Description of goal.	The Static Structure Diagrams.
	SLO-2	The Software Crisis, description of the real world using the Objects Model.	Case study on using state diagram and activity diagram	Description of component model	Defining UML Method, Operation.	The Class Diagram Model.
S 3-4	SLO-1	Lab 1: Package Diagram Model.	Lab4: Dynamic Model: State Diagram / Activity Diagram.	Lab 7: Component Diagram Model.	Lab10: Initial DB design in a UML environment.	Lab 13: Deployment Model. Tasks.
	SLO-2	Description of the model.				
S-5	SLO-1	Classes, inheritance	General description of various models.	Writing a case goal.	Object and Interface	Attributes descriptions.
	SLO-2	Multiple configurations	Examples on each model	Use case modelling to describe functional requirements	Comparison on interface and class	Operations descriptions.
S-6	SLO-1	Quality software characteristics	The process of Object-Oriented software development.	Comparing use case and use case diagrams	Sequence Diagram.	Connections descriptions in the Static Model.
	SLO-2	Description of packages	Characteristics of software development	Use Case Diagrams.	Finding objects from Flow of Events.	Description of Threads
S	SLO-1		Lab 5: Description of the Activity Diagram.	Lab 8: Physical Aspect. Logical Aspect.	Lab 11: Deployment Model - Processors.	Lab 14: Threads.

Duration (hour)		12	12	12	12	12
7-8	SLO-2	*Lab 2: Connections between packagers.Interfaces.*				
S-9	SLO-1	*Description of the Object-Oriented Analysis process and the Structure Analysis Model.*	*Description of Design Patterns.*	*Use Case Relationships.*	*Describing the process of finding objects using a Sequence Diagram.*	*Association, Generalization*
	SLO-2	*Comparison of analysis models*	*Technological Description of Distributed Systems.*	*Case study on requirements analysis*	*Examples on sequence diagrms*	*Aggregation.*
S-10	SLO-1	*White box*	*Description of the State Diagram.*	*Examples on Use case diagrams*	*Describing the process of finding objects using a Collaboration Diagram.*	*Dependency, Interfacing.*
	SLO-2	*Black box*	*Events Handling.*	*User interface*	*Examples on collaboration diagrams*	*Multiplicity.*
S 11-12	SLO-1	*Lab 3: Create Package Diagram. Drill Down.*	*Lab 6: Exercise in State Machines.*	*Lab9: Connections and Dependencies. User Interface.*	*Lab 12: Connections. Components.*	*Lab 15: Signals and Events.*
	SLO-2					

Learning Resources	*1. Object-Oriented Software Engineering: using UML, Patterns, and Java. Bernd Bruegge and Allen H. Dutoit.* *2. Design Patterns: Elements of Reusable Object-Oriented Software. Erich Gamma, Richard Helm, Ralph Johnson, and John M. Vlissides.*

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Understand										
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze										
Level 3	Evaluate	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert from TCS	*1. Dr. Srinivasa Rao Bakshi, IITM, Chennai, sbakshi@iitm.ac.in*	*1. Ms.A.NithyaKalyani, SRMIST*
	2. Dr. Ramesh Babu, N , nrbabu@iitm.ac.in	
	3.Dr.Noor Mahammad, IIITDM, Kancheepuram,noor@iiitdm.ac.in	

Course Code	18PDM202L	Course Name	CRITICAL AND CREATIVE THINKING SKILLS	Course Category	*M*	*Mandatory*	L	T	P	C
							0	0	2	0

Pre-requisite Courses	*Nil*	Co-requisite Courses	*Nil*	Progressive Courses	*Nil*
Course Offering Department	*Career Development Centre*	Data Book / Codes/Standards		*Nil*	

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*
CLR-1 :	*identify problems*
CLR-2 :	*recognize the logical coherence of ideas*
CLR-3 :	*understand the structure and principles of writing*
CLR-4 :	*interpret the structure, organization, tone, and main idea of the content*
CLR-5 :	*hone comprehension skills*
CLR-6 :	*give the right knowledge, skill and aptitude to face any competitive examination*

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	**Learning**		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	*solve problems*	*3*	*80*	*75*
CLO-2 :	*grasp the approaches and strategies to find solutions*	*2*	*80*	*75*
CLO-3 :	*organize and articulate ideas clearly*	*2*	*80*	*75*
CLO-4 :	*analyze and evaluate contents critically in multifarious ways*	*2*	*80*	*75*
CLO-5 :	*understand, comprehend and provide logical conclusions*	*2*	*80*	*75*
CLO-6 :	*gain appropriate skills to succeed in preliminary selection process for recruitment*	*3*	*80*	*75*

Program Learning Outcomes (PLO)															
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
L	*H*	-	*M*	-	-	-	-	*M*	*L*	-	*H*	-	-	-
L	*H*	-	*M*	-	-	-	-	*M*	*L*	-	*H*	-	-	-
L	*H*	-	*M*	-	-	-	-	*M*	*L*	-	*H*	-	-	-
L	*H*	-	*M*	-	-	-	-	*M*	*L*	-	*H*	-	-	-
L	*H*	-	*M*	-	-	-	-	*M*	*H*	-	*H*	-	-	-
L	*H*	-	*M*	-	-	-	-	*M*	*H*	-	*H*	-	-	-

Duration (hour)		**6**	**6**	**6**	**6**	**6**
S-1	SLO-1	*Ages*	*Permutations-Types*	*Probability-Intro*	*Logical Reasoning – Blood relations, Directions*	*Information Ordering - Analogy*
	SLO-2	*Solving Problems*	*Solving Problems*	*Solving Problems*	*Series completion*	*Math operations*
S-2	SLO-1	*Case Study*	*Statement Completion*	*Principles of Writing*	*Reading Comprehension – Bold Faced*	*Para Completion*
	SLO-2	*Discussion*	*Practice*	*Practice*	*Practice*	*Practice*
S-3	SLO-1	*Quadratic Equations*	*Combination-Concepts*	*Probability theory -Applications*	*Logical Reasoning- Cubes*	*Analytical Reasoning-Intro*
	SLO-2	*In-equations*	*Solving Problems*	*Solving Problems*	*Logical Reasoning-syllogism*	*Analytical Reasoning - Level I*
S-4	SLO-1	*Case Study*	*Statement Completion*	*Principles of Writing*	*Reading Comprehension – Bold Faced*	*Para Completion*
	SLO-2	*Discussion*	*Practice*	*Practice*	*Practice*	*Practice*
S-5	SLO-1	*Permutations-Concepts*	*Combination- Miscellaneous*	*Logical Reasoning – Coding and Decoding*	*Information Ordering - Arrangements*	*Analytical Reasoning-Level II*
	SLO-2	*Solving Problems*	*Solving Problems*	*Practice*	*Practice*	*Analytical Reasoning - Level III*
S-6	SLO-1	*Case Study*	*Statement Completion*	*Principles of Writing*	*Reading Comprehension – Miscellaneous*	*Para Completion*
	SLO-2	*Discussion*	*Practice*	*Practice*	*Practice*	*Practice*

Learning Resources	1. *Dinesh Khattar-The Pearson Guide to Quantitative Aptitude for competitive examinations* 2. *Hari Mohan Prasad, Verbal Ability for Competitive Examinations, Tata McGraw Hill Publications* 3. *Edgar Thrope, Test of Reasoning for Competitive Examinations, Tata McGraw Hill, 4th Edition, 2012* 4. *Norman Lewis, Word Power Made Easy, W.R. Goyal Publications, 2011*	5. *Ellet William, The Case Study Handbook: How to read, discuss, and write persuasively about cases* 6. *Manhattan GMAT – Critical Reasoning, GMAT Strategy Guide, 12th Edition* 7. *Wiley's GMAT Reading Comprehension Grail, Wiley, 2016* 8. *Manhattan Prep GRE : Reading Comprehension and Essays, 5th Edition*

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (100% weightage)								Final Examination	
		CLA – 1 (20%)		CLA – 2 (30%)		CLA – 3 (30%)		CLA – 4 (20%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	-	*40%*	-	*30%*	-	*30%*	-	*30%*	-	-
Level 2	Apply Analyze	-	*40%*	-	*40%*	-	*40%*	-	*40%*	-	-
Level 3	Evaluate Create	-	*20%*	-	*30%*	-	*30%*	-	*30%*	-	-
	Total	100 %		100 %		100 %		100 %		-	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts	
1. Mr. Vijay Nayar, Director, Education Matters, vijayn@edumat.com	*1. Dr. Dinesh Khattar, Delhi University, dinesh.khattar31@gmail.com*	*1. Dr. M. Snehalatha, SRMIST*	*3. Dr. P. Madhusoodhanan, SRMIST*
2. Mr. Ajay Zenner, Career Launcher, ajay.z@careerlauncher.com	*2. Mr. Nishith Sinha, dueNorth India Academics LLP, nsinha.alexander@gmail.com*	*2. Mr Jayapragash J., SRMIST*	*4. Mr. Clement A, SRMIST*

Course Code	18CYM101T	Course Name	ENVIRONMENTAL SCIENCE	Course Category	M	Mandatory	L	T	P	C
							1	0	0	0

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Chemistry	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	Acquire knowledge on various causes, effects and control measures of environmental air and water pollution
CLR-2 :	Analyze causes, effects and control measures of soil, thermal and radiation pollution
CLR-3 :	Utilize processes involved in waste water treatment and study the cause of a local polluted site
CLR-4 :	Analyze impacts, disposal methods and treatments involved in solid waste management
CLR-5 :	Identify impacts, disposal methods, treatments involved in biomedical waste management
CLR-6 :	Analyze the environmental issues and identify appropriate solutions

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning 1 Level of Thinking (Bloom)	2 Expected Proficiency (%)	3 Expected Attainment (%)	Program Learning Outcomes (PLO) 1 Engineering Knowledge	2 Problem Analysis	3 Design & Development	4 Analysis, Design, Research	5 Modern Tool Usage	6 Society & Culture	7 Environment & Sustainability	8 Ethics	9 Individual & Team Work	10 Communication	11 Project Mgt. & Finance	12 Life Long Learning	13 PSO - 1	14 PSO - 2	15 PSO – 3
CLO-1 :	Analyze the sources, effects and control measures of environmental air pollution	1	80	70	H	H	H	H	-	-	H	-	-	-	-	-	-	-	-
CLO-2 :	Acquire knowledge on the treatment of soil, thermal and radiation management	1	75	65	H	H	H	H	-	-	H	-	-	-	-	-	-	-	-
CLO-3 :	Acquire knowledge on various process involved in the treatment of wastewater	1	80	70	H	H	H	H	-	-	H	-	H	-	-	-	-	-	-
CLO-4 :	Identify sources, disposal and treatment methods of solid waste management	1	80	75	H	H	H	H	-	-	H	-	H	-	-	-	-	-	-
CLO-5 :	Identify sources, disposal and treatment methods of biomedical waste management	1	75	65	H	H	H	H	-	-	H	-	H	-	-	-	-	-	-
CLO-6 :	Utilize the concepts learnt in protecting the environment towards sustainable development	1	80	70	H	H	H	H	-	-	H	-	H	-	-	-	-	-	-

Duration (hour)		3	3	3	3	3
S-1	SLO-1	Environmental segments Structure of atmosphere	Determination of BOD, COD	Waste water treatment- Introduction	Solid waste management: Types	Biomedical Waste Management Definition and Effects
	SLO-2	Composition of atmosphere	Determination of TDS and trace metals	Primary treatment	Effects Processof waste management	Categories of biomedical waste
S-2	SLO-1	Air Pollution Sources	Sources, effects and control measures of Soil pollution	Secondary treatment	Disposal methods, Opendumping Engineered land filling	Process of biomedical waste management
	SLO-2	Effects – acid rain, ozone layer depletion and greenhouse effect	Sources, effects and control measures of Thermal pollution	Tertiary treatment	Composting Incineration	Treatment and disposal methods
S-3	SLO-1	Control measures of air pollution	Sources and effects of: Radiation pollution	Activity: Visit to a local polluted site-Urban/Rural/Industrial/Agricultural	Activity: Monitoring solid waste management in local areas	Activity: Visit a hospital to understand the biomedical waste management
	SLO-2	Sources, Effects and control measures of Water pollution	Control measures of Radiation pollution	Activity: Visit to a local polluted site-Urban/Rural/Industrial/Agricultural	Activity: Monitoring solid waste management in local areas	Activity: Visit a hospital to understand the biomedical waste management

Learning Resources	
	1. Erach Bharucha, Textbook of Environmental Studies for Undergraduate Courses, 2nd ed., UGC 2. Kamaraj. P, Arthanareeswari. M, Environmental Science–Challenges and Changes, 6th ed., Sudhandhira Publications, 2013 3. R.Jeyalakshmi, Principles of Environmental Science, 2nd ed., Devi publications, 2008 4. 4. Helen P Kavitha, Principles of Environmental Science, 1st ed., Shine Publications and Distributors,2013

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (100% weightage)								Final Examination	
		CLA – 1 (20%)		CLA – 2 (30%)		CLA – 3 (30%)		CLA – 4 (20%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*40%*	-	*30%*	-	*30%*	-	*30%*	-	-	-
	Understand										
Level 2	Apply	*40%*	-	*40%*	-	*40%*	-	*40%*	-	-	-
	Analyze										
Level 3	Evaluate	*20%*	-	*30%*	-	*30%*	-	*30%*	-	-	-
	Create										
	Total	100 %		100 %		100 %		100 %		-	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. Sudarshan Mahapatra, Encube Ethicals Pvt. Ltd, sudarshan.m@encubeethicals.com	*1. Prof. G. Sekar, IIT Madras, gsekar@iitm.ac.in*	*1. Prof. M. Arthanareeswari, SRMIST*
2. Dr. Shanmukhaprasad Gopi, Dr. Reddy' s Laboratories, shanmukhaprasadg@drreddys.com	*2. Prof. Vivek Polshettiwar, TIFR Mumbai, vivekpol@tifr.res.in*	*2. Dr. K. K. R. Datta, SRMIST*

Course Code	18MAB161T	Course Name	DISCRETE MATHEMATICS	Course Category	B	Basic Sciences	L	T	P	C
							3	1	0	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics	Data Book / Codes/Standards		Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)

		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	Apply Boolean algebra, truth table, logic gates, in computer science and communication.			
CLR-2 :	Apply concepts of Differential.			
CLR-3 :	Apply concepts of integral Calculus-- Multiple integrals for solving engineering problems.			
CLR-4 :	Apply set theory, relations in storage, communication and manipulation of data. Learning about groups, rings and fields. Using them to solve engineering related problems.			
CLR-5 :	Using combinatory, counting problems, generating functions, recurrence relations in computer network .Apply principle of Mathematical induction and Pigeon hole principle.			
CLR-6 :	Utilize the concepts in Discrete Mathematics for the understanding of Engineering and Technology			

Course Learning Outcomes (CLO):	**At the end of this course, learners will be able to:**	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Gaining knowledge in Boolean arithmetic to solve problems using logic gates.	2	85	80	M	H	L						M	L		H			
CLO-2 :	Solving problems in Differential calculus and its applications.	2	85	80	M	H		M	M				M			H			
CLO-3 :	Solving problems in Integral calculus applying them to solve multiple integral problems.	2	85	80	M	H							M			H			
CLO-4 :	Problem solving in sets and relations. Gaining knowledge in groups, rings and fields. Solving simple problems using elementary concepts.	2	85	80	M	H		M					M			H			
CLO-5 :	Solving problems in basic counting principles, inclusion exclusion and number theory.	2	85	80	M	H	L						M	L		H			
CLO-6 :	Apply the concepts of Boolean Algebra, Abstract Algebra, counting principles, recurrence relations and calculus in real world problems related to Computer Science and Business systems	2	85	80															

Duration (hour)		**Learning Unit / Module 1**	**Learning Unit / Module 2**	**Learning Unit / Module 3**	**Learning Unit / Module 4**	**Learning Unit / Module 5**
		12	**12**	**12**	**12**	**12**
S-1	SLO-1	*Introduction to Boolean Algebra- basic definitions.*	*Differential calculus introduction*	*Integral calculus-reduction formulae*	*Introduction to Sets – simple examples.*	*Basic counting-Permutation and Combination*
	SLO-2	*Axiomatic definition of Boolean Algebra, logic gates.*	*Differential calculus introduction*	*Problems based on reduction formulae.*	*Properties of sets*	*Basic counting-Permutation and Combination*
S-2	SLO-1	*Postulates of Boolean Algebra.*	*Successive differentiation.*	*Integral calculus-reduction formulae*	*Relations- definitions and examples.*	*Balls and bins problems.*
	SLO-2	*Postulates of Boolean Algebra.*	*Successive differentiation.*	*Problems based on reduction formulae.*	*Relations- definitions and examples.*	*Balls and bins problems.*
S-3	SLO-1	*Problems using the postulates of Boolean Algebra*	*Standard results, preliminary transformations and use of partial fractions.*	*Definite integrals properties without proof.*	*Problems on relations- types of relations.*	*Balls and bins problems.*

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		12	12	12	12	12
	SLO-2	*Problems using the postulates of Boolean Algebra*	*Standard results, preliminary transformations and use of partial fractions.*	*Problems based on definite integral properties.*	*Problems on relations- types of relations.*	*Balls and bins problems.*
S-4	SLO-1	*Problem solving using tutorial sheet 1*	*Problem solving using tutorial sheet 4*	*Problem solving using tutorial sheet 7*	*Problem solving using tutorial sheet 10*	*Problem solving using tutorial sheet 13*
	SLO-2	*Problem solving using tutorial sheet 1*	*Problem solving using tutorial sheet 4*	*Problem solving using tutorial sheet 7*	*Problem solving using tutorial sheet 10*	*Problem solving using tutorial sheet 13*
S-5	SLO-1	*Principle of Duality.*	*Leibnitz's theorem,*	*Integral as the limit of a sum*	*Binary operation on a set- Groups and axioms of groups.*	*Generating functions*
	SLO-2	*Principle of Duality.*	*Problems using Leibnitz's theorem*	*Integral as the limit of a sum*	*Properties of groups.*	*Problems on generating functions*
S-6	SLO-1	*Problems based on principle of Duality*	*Problems using Leibnitz's theorem*	*Double integrals*	*Examples of groups.*	*Problems on generating functions*
	SLO-2	*Problems based on principle of Duality.*	*Problems using Leibnitz's theorem*	*Double integrals problems*	*Permutation group, equivalence classes with addition modulo m and multiplication modulo m.*	*Problems on generating functions*
S-7	SLO-1	*Canonical forms.*	*Taylor's series simple problems*	*Changing the order of integration.*	*Cyclic groups and properties.*	*Recurrence relations problems*
	SLO-2	*Minterms and maxterms, sum of minterms, product of maxterms,*	*Taylor's series simple problems*	*Problems on Changing the order of integration.*	*Subgroups and necessary and sufficiency of a subset to be a subgroup.*	*Recurrence relations problems*
S-8	SLO-1	*Problem solving using tutorial sheet 2 in duality and minterm and maxterm concepts.*	*Problem solving using tutorial sheet 5*	*Problem solving using tutorial sheet 8*	*Problem solving using tutorial sheet 11*	*Problem solving using tutorial sheet 14*
	SLO-2	*Problem solving using tutorial sheet 2 in duality and minterm and maxterm concepts.*	*Problem solving using tutorial sheet 5*	*Problem solving using tutorial sheet 8*	*Problem solving using tutorial sheet 11*	*Problem solving using tutorial sheet 14*
S-9	SLO-1	*Conversion between canonical forms.*	*Problems on radius of curvature and centre of curvature.*	*Double integrals in polar coordinates*	*Cosets and examples.*	*Recurrence relations problems*
	SLO-2	*Conversion between canonical forms.*	*Problems on radius of curvature and centre of curvature.*	*Area enclosed by plane curves*	*Rings- definition and examples. Properties*	*Recurrence relations problems*
S-10	SLO-1	*Karnaugh maps.*	*Problems on radius of curvature and centre of curvature.*	*Inconsistency and indirect method of proof.*	*Special classes of rings*	*Proof techniques- principle of Mathematical induction*
	SLO-2	*Two and three variable maps.*	*Problems on radius of curvature and centre of curvature.*	*Volume of solids- volume as double integrals*	*Ideal and Quotient rings.*	*Problems using the principle of Mathematical induction*
S-11	SLO-1	*Four variable maps.*	*Problems on radius of curvature and centre of curvature.*	*Volume of solids- volume as triple integrals*	*Fields – definition and examples.*	*Pigeon hole principle*
	SLO-2	*Five and six variable maps.*	*Problems on radius of curvature and centre of curvature.*	*Volume of solids- volume as triple integrals*	*Fields – definition and examples.*	*Problems on pigeon hole principle.*
S-12	SLO-1	*Problem solving using tutorial sheet 3 for conversion between canonical forms.*	*Problem solving using tutorial sheet 6 in application of differential calculus in Engineering.*	*Problem solving using tutorial sheet 9 on applications of double integrals*	*Problem solving using tutorial sheet 12*	*Problem solving using tutorial sheet 15*
	SLO-2	*Problem solving using tutorial sheet 3 using K-maps.*	*Problem solving using tutorial sheet 6 in application of differential calculus in Engineering.*	*Problem solving using tutorial sheet 9 on applications of double integrals*	*Problem solving using tutorial sheet 12*	*Problem solving using tutorial sheet 15*

Learning Resources	*1.* N. Herstein, "Topics in Algebra", John Wiley and Sons *2.* M. Morris Mano, "Digital Logic & Computer Design", Pearson *3.* B. S. Grewal, "Higher Engineering Mathematics", Khanna Publication, Delhi.	*4.* Gilbert Strang: Introduction to linear algebra *5.* Peter V. O'Neil, "Advanced Engineering Mathematics", Seventh Edition, Thomson Learning. *6.* M. D. Greenberg, "Advanced Engineering Mathematics", Second Edition, Pearson Education. *7.* P. N. Wartikar and J. N. Wartikar, "Applied Mathematics". Vol. I & II, VidyarthiPrakashan

Learning Assessment											
	Bloom's Level of Thinking	**Continuous Learning Assessment (50% weightage)**								**Final Examination (50% weightage)**	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	40%	-	30%	-	30%	-	30%	-	30%	-
	Understand										
Level 2	Apply	40%	-	40%	-	40%	-	40%	-	40%	-
	Analyze										
Level 3	Evaluate	20%	-	30%	-	30%	-	30%	-	30%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study

Course Designers		
Experts from Industry	**Experts from Higher Technical Institutions**	**Internal Experts**
Expert from Industry	*Dr.K.C.Sivakumar*	*Dr.A.Govindarajan*
	Dr.Nanjundan	*Dr.Srinivasan*

Course Code	18MAB162T	Course Name	PROBABILITY AND STATISTICS	Course Category	B	Basic Sciences	L	T	P	C
							3	0	0	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics	Data Book / Codes/Standards		Statistical tables	

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)

		1	2	3
CLR-1 :	To apply the basic rules and theorems of probability theory such as Baye's Theorem, to determine probabilities that help to solve engineering problems and to determine the expectation and variance of a random variable from its distribution.			
CLR-2 :	To appropriately choose, define probability distributions such as the Binomial, Poisson and Normale tc to model and solve engineering problems.			
CLR-3 :	To learn the basics of statistics, collection, estimate of statistical data			
CLR-4 :	To understand how correlation and regression analysis can be used to develop an equation that estimates how two variables are related			
CLR-5 :	To comprehend the fundamentals of sampling techniques of finite and infinite populations			

Course Learning Outcomes (CLO):	**At the end of this course, learners will be able to:**	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	Pertain the Knowledge of probability concepts, to determine probabilities that help to solve engineering problems. and to determine the expectation and variance of a random variable from its distribution	*2*	*85*	*80*
CLO-2 :	Gain familiarity in deriving probability distributions such as the Binomial, Poisson and Normal etc and apply them tn the problems involving Science and Engineering	*2*	*85*	*80*
CLO-3 :	Acquire knowledge in descriptive statistics	*2*	*85*	*80*
CLO-4 :	Getting the knowledge of correlation, Regression analysis and apply them in the problems in Science and Engineering	*2*	*85*	*80*
CLO-5 :	Understanding the concept and applications of sampling techniques	*2*	*85*	*80*

		1 Engineering Knowledge	2 Problem Analysis	3 Design & Development	4 Analysis, Design, Research	5 Modern Tool Usage	6 Society & Culture	7 Environment & Sustainability	8 Ethics	9 Individual & Team Work	10 Communication	11 Project Mgt. & Finance	12 Life Long Learning	13 PSO - 1	14 PSO - 2	15 PSO – 3
CLO-1 :	Pertain the Knowledge of probability concepts, to determine probabilities that help to solve engineering problems. and to determine the expectation and variance of a random variable from its distribution	*M*		*M*						*M*			*H*			
CLO-2 :	Gain familiarity in deriving probability distributions such as the Binomial, Poisson and Normal etc and apply them tn the problems involving Science and Engineering	*M*			*M*	*M*										
CLO-3 :	Acquire knowledge in descriptive statistics		*M*							*M*			*H*			
CLO-4 :	Getting the knowledge of correlation, Regression analysis and apply them in the problems in Science and Engineering	*M*	*M*		*M*					*M*			*H*			
CLO-5 :	Understanding the concept and applications of sampling techniques		*M*	*M*						*M*			*H*			

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		12	12	12	12	12
S-1	SLO-1	*probability concepts, Types of experiments, Events, sample space, combinatorial probability*	*Discrete distributions*	*Definition of Statistics*	*Descriptive measures*	*Sampling techniques*
	SLO-2	*Axioms and theorems*	*Binomial distribution*	*Basic objectives*	*central tendency*	*Random sampling*
S-2	SLO-1	*Conditional probability, Baye's theorem – without proof*	*Fitting binomial distribution*	*Applications in various branches of science with examples*	*Mean, median and mode*	*Sampling from finite and infinite population*
	SLO-2	*Applications- Baye's Theorem.*	*Poisson distribution*	*More examples*	*Problems on mean*	*Simple random sampling*
S-3	SLO-1	*Random variables – Discrete case*	*Fitting Poisson distribution*	*Collection of Data, internal and external data*	*Problems on median and mode*	*Simple random sampling*
	SLO-2	*Probability Mass function*	*Applications of binomial and Poisson distribution*	*Primary and secondary data*	*Dispersion*	*Stratified random sampling*

Duration (hour)		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
		12	12	12	12	12
S-4	SLO-1	*Problem solving using tutorial sheet 1*	*Problem solving using tutorial sheet 4*	*Problem solving using tutorial sheet 7*	*Range, Quartile deviation*	*Problem solving using tutorial sheet 13*
	SLO-2	*Problem solving using tutorial sheet 1*	*Problem solving using tutorial sheet 4*	*Problem solving using tutorial sheet 7*	*Standard deviation*	*Problem solving using tutorial sheet 13*
S-5	SLO-1	*Cumulative distribution function*	*Geometric distribution*	*Population and sample*	*Coefficient of variation*	*Systematic sampling*
	SLO-2	*Mathematical expectation –discrete case*	*Memory less property*	*Representative sample*	*Bivariate data. Summarization*	*Systematic sampling*
S-6	SLO-1	*Variance*	*Continuous distribution: Uniform distribution*	*Descriptive Statistics,*	*marginal and conditional frequency distribution*	*Cluster sampling*
	SLO-2	*Probability density function*	*Applications of Uniform distribution*	*Classification of Univariate data*	*marginal and conditional frequency distribution*	*Cluster sampling*
S-7	SLO-1	*Cumulative distribution function*	*Exponential distribution, Memory less property*	*tabulation of univariate data*	*Applications central tendency and dispersion*	*Estimates and standard error of sampling with replacement*
	SLO-2	*Mathematical expectation-continuous case*	*Applications of exponential distribution*	*Applications of descriptive statistics*	*Applications central tendency and dispersion*	*Estimates and standard error of sampling with replacement*
S-8	SLO-1	*Problem solving using tutorial sheet 2*	*Problem solving using tutorial sheet 5*	*Problem solving using tutorial sheet 8*	*Problem solving using tutorial sheet 11*	*Problem solving using tutorial sheet 14*
	SLO-2	*Problem solving using tutorial sheet 2*	*Problem solving using tutorial sheet 5*	*Problem solving using tutorial sheet 8*	*Problem solving using tutorial sheet 11*	*Problem solving using tutorial sheet 14*
S-9	SLO-1	*Variance*	*Normal distribution*	*Graphical representation*	*Linear Correlation*	*Estimates and standard error of sampling without replacement*
	SLO-2	*Raw Moments*	*Applications of normal distribution*	*Graphical representation*	*scatter diagram*	*Estimates and standard error of sampling without replacement*
S-10	SLO-1	*Central Moments*	*Chi-Square distribution*	*Applications of graphical representation*	*Karl-Pearson correlation*	*Sampling distribution of sample mean*
	SLO-2	*Moment generating function*	*Applications of Chi- square distribution*	*Frequency curves*	*Spearman's rank correlation*	*Sampling distribution of sample mean*
S-11	SLO-1	*MGF- discrete random variable*	*t- Distribution, F- Distribution*	*Frequency curves*	*Linear regression*	*Applications of sampling distribution of mean*
	SLO-2	*MGF- continuous random variable*	*Applications of t, F- distributions*	*Applications of Frequency curves*	*Least square method- Fitting a straight line*	*Applications of sampling distribution of mean*
S-12	SLO-1	*Problem solving using tutorial sheet 3*	*Problem solving using tutorial sheet 6*	*Problem solving using tutorial sheet 9*	*Problem solving using tutorial sheet 12*	*Problem solving using tutorial sheet 15*
	SLO-2	*Applications of Probability in Engineering field*	*Application of distributions in Engineering*	*Applications and the importance of descriptive statistics*	*Engineering Applications of Correlation and Regression*	*Engineering applications of sampling techniques*

Learning Resources	*1.* **S**.M. Ross, A First Course in Probability, 6th Ed., Pearson Education India,2002. *2.* A. Goon, M. Gupta and B. Dasgupta, "Fundamentals of Statistics", vol. I &II,WorldPress.	*3.* R. Miller, J.E. Freund and R. Johnson, "Probability and Statistics for Engineers". Fourth Edition,PHI. *4.* A. M. Mood,F.A. Graybill and D.C. Boes, "Introduction to the Theory of Statistics", McGraw HillEducation.

Learning Assessment											
	Bloom's Level of Thinking	**Continuous Learning Assessment (50% weightage)**								**Final Examination (50% weightage)**	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	40%	-	30%	-	30%	-	30%	-	30%	-
	Understand										
Level 2	Apply	40%	-	40%	-	40%	-	40%	-	40%	-
	Analyze										
Level 3	Evaluate	20%	-	30%	-	30%	-	30%	-	30%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study

Course Designers		
Experts from Industry	**Experts from Higher Technical Institutions**	**Internal Experts**
Expert from Industry	*Dr.K.C.Sivakumar*	*Dr.A.Govindarajan*
	Dr.Nanjundan	*Dr.Srinivasan*

Course Code	18MAB164J	Course Name	STATISTICAL MODELLING	Course Category	B	Basic Sciences	L	T	P	C
							3	0	2	4

Pre-requisite Courses	18MAB162T	Co-requisite Courses	*Nil*	Progressive Courses	
Course Offering Department	*Mathematics*	Data Book / Codes/Standards		Statistical tables	

CLR-1 :	To apply the basic Linear Statistical Models in Engineering field and to understand how correlation and regression analysis can be used to develop an equation that estimates how two variables are related
CLR-2 :	To learn the procedure of estimate of statistical data
CLR-3 :	To learn the basics and importance of Testing Hypothesis
CLR-4 :	To learn the basics and importance of Non-parametric methods in testing hypothesis
CLR-5 :	To know the procedure for Time Series Analysis & Forecasting
CLR-6 :	To comprehend the applications of R statistical programming language and acquired the knowledge of statistical modeling using R programming

Course Learning Outcomes (CLO):	**At the end of this course, learners will be able to:**	**1** Level of Thinking (Bloom)	**2** Expected Proficiency (%)	**3** Expected Attainment (%)
CLO-1 :	Pertain the Knowledge of Linear Statistical Models in Engineering field and to understand how correlation and regression analysis	3	85	80
CLO-2 :	Gain familiarity in estimate of statistical data	3	85	80
CLO-3 :	Acquire knowledge in Testing Hypothesis	3	85	80
CLO-4 :	Gaining knowledge in non-parametric methods	3	85	80
CLO-5 :	Getting the knowledge of Time Series Analysis & Forecasting and apply them in the problems in Science and Engineering	3	85	80
CLO-6 :	Understanding the concept and applications of R statistical programming language and to solve the problems of statistics using R programming	3		

	1 Engineering Knowledge	**2** Problem Analysis	**3** Design & Development	**4** Analysis, Design, Research	**5** Modern Tool Usage	**6** Society & Culture	**7** Environment & Sustainability	**8** Ethics	**9** Individual & Team Work	**10** Communication	**11** Project Mgt. & Finance	**12** Life Long Learning	**13** PSO - 1	**14** PSO - 2	**15** PSO – 3
CLO-1 :	M	H	L						M	L		H			
CLO-2 :	M	H		M	M				M			H			
CLO-3 :		M							M			H			
CLO-4 :	M	H	L	M					M	L		H			
CLO-5 :	M	H	M						M			H			
CLO-6 :	M	H							M			H			

		Learning Unit / Module 1	**Learning Unit / Module 2**	**Learning Unit / Module 3**	**Learning Unit / Module 4**	**Learning Unit / Module 5**
Duration (hour)		**15**	**15**	**15**	**15**	**15**
S-1	SLO-1	*Linear Statistical Models - Introduction*	*Introduction to Estimation*	*Problems based on Methods of estimation including maximum likelihood estimation.*	*Non-parametric Inference*	*Basics of Time Series Analysis & Forecasting*
	SLO-2	*Linear Statistical Models - Introduction*	*Introduction to Estimation*	*Problems based on Methods of estimation including maximum likelihood estimation.*	*Non-parametric Inference*	*Basics of Time Series Analysis & Forecasting*
S-2	SLO-1	*Simple linear correlation*	*Point estimation*	*Problems based on consistency*	*Comparison with parametric inference*	*Stationary models*
	SLO-2	*Simple linear correlation*	*Point estimation*	*Problems based on consistency*	*Use of order statistics*	*Stationary models identification*
S-3	SLO-1	*Simple linear regression*	*Point estimation*	*Problems based on sufficient estimation*	*Signtest*	*Stationary models Estimation and Forecasting*
	SLO-2	*Simple linear regression*	*criteria for good estimates (un-biasedness*	*Problems based on sufficient estimation*	*Wilcoxon signed rank test*	*Stationary models Estimation and Forecasting*
S-4-5	SLO-1	*Lab 1: Introduction to R*	*Lab 4: Working with Vectors and Matrices*	*Lab 7: Writing Data*	*Lab 10: Manipulating Data*	*Lab 13: Data Frame*
	SLO-2					
S-6	SLO-1	*multiplecorrelation*	*criteria for good estimates (consistency)*	*Introduction to Test of hypothesis*	*Mann-Whitney*	*ARIMA Models*
	SLO-2	*multiplecorrelation*	*criteria for good estimates (consistency)*	*Concept & formulation*	*Mann-Whitney*	*ARIMA Models identification*

		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
Duration (hour)		**15**	**15**	**15**	**15**	**15**
S-7	SLO-1	*multiple regression Sufficient Statistic: Concept & examples*	*Methods of estimation including maximum likelihood estimation.*	*Type I and Type II errors*	*Run test*	*ARIMA Models Estimation and Forecasting*
	SLO-2	*multiple regression*	*Methods of estimation including maximum likelihood estimation.*	*Type I and Type II errors*	*Run test*	*ARIMA Models Estimation and Forecasting*
S-8	SLO-1	*Introduction to Analysis of variance*	*Problems based on Methods of estimation including maximum likelihood estimation.*	*Neyman Pearson lemma*	*Kolmogorov-Smirnov test*	*Problems based on ARIMA Models*
	SLO-2	*One way ANOVA with as well as without interaction*	*Sufficient Statistic: Concept & examples*	*Neyman Pearson lemma*	*Kolmogorov-Smirnov test*	*Problems based on ARIMA Models*
S-9-10	SLO-1	*Lab 2: Functions-*	*Lab 5:Working with Vectors and Matrices*	*Lab 8: Working with Data*	*Lab 11: Manipulating Data*	*Lab 14: Graphics in R*
	SLO-2	*Control flow and Loops*				
S-11	SLO-1	*Problems based on One way ANOVA*	*Sufficient Statistic: Concept & examples*	*Example based on Neyman Pearson lemma*	*Spearman's and Kendall's test, Tolerance region*	*Problems based on Stationary models*
	SLO-2	*Problems based on Two way ANOVA*	*complete sufficiency, their application in estimation*	*Example based on Neyman Pearson lemma*	*Spearman's and Kendall's test, Tolerance region*	*Problems based on Stationary models*
S-12	SLO-1	*Problems based on one and Two way*	*complete sufficiency, their application in estimation*	*More Example based on Neyman Pearson lemma*	*More problems based on Non-Parametric methods*	*Problems based on Stationary models*
	SLO-2	*ANOVA*				*ARIMA Models*
S-13	SLO-1	*Applications of Linear Statistical Models and*	*Application of estimation in Engineering field*	*Application of estimation and testing hypothesis in Engineering*	*Applications and the importance of Testing Hypothesis*	*Engineering Applications ofTime Series Analysis & Forecasting*
	SLO-2	*ANOVA in Engineering field*				
S – 14-15	SLO-1	*Lab 3: Functions-*	*Lab 6: Reading in Data*	*Lab 9: Working with Data*	*Lab 12: Simulation - Linear model*	*Lab 15: Graphics in R*
	SLO-2	*Control flow and Loops*				

Learning Resources	1. Probability and Statistics for Engineers (4th Edition), I.R. Miller, J.E. Freund and R. Johnson, 2015. 2. Fundamentals of Statistics (Vol. I & Vol. II), A. Gun, M. k. Gupta and B.Dasgupta, 2016.	3. The Analysis of Time Series: An Introduction, Chris Chatfield, Sixth edition-2016. 4. Hands-on Programming with R,- Garrett Grolemund, 2014 5. R for Everyone: Advanced Analytics and Graphics, Jared P. Lander, First edition-2013.

Learning Assessment											
	Bloom's Level of Thinking	*Continuous Learning Assessment (50% weightage)*								*Final Examination (50% weightage)*	
		CLA – 1 (10%)		*CLA – 2 (15%)*		*CLA – 3 (15%)*		*CLA – 4 (10%)*			
		Theory	*Practice*	*Theory*	*Practice*	*Theory*	*Practice*	*Theory*	*Practice*	*Theory*	*Practice*
Level 1	*Remember*	*20 %*	*20 %*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Understand										
Level 2	*Apply*	*20 %*	*20 %*	*20 %*	*20 %*	*20 %*	*20 %*	*20 %*	*20 %*	*20 %*	*20 %*
	Analyze										
Level 3	*Evaluate*	*10 %*	*10 %*	*15 %*	*15 %*	*15 %*	*15 %*	*15 %*	*15 %*	*15 %*	*15 %*
	Create										
	Total	*100 %*		*100 %*		*100 %*		*100 %*		*100 %*	

 # CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert from Industry	*Dr.K.C.Sivakumar*	*Dr.A.Govindarajan*
	Dr.Nanjundan	*Dr.Srinivasan*

SEMESTER - V

Course Code	18MBH361T	Course Name	BUSINESS COMMUNICATION & VALUE SCIENCE – III	Course Category	H	Humanities and Social Sciences	L	T	P	C
							2	0	0	2

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	MBA	Data Book / Codes/Standards			

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*
CLR-1 :	Develop technical writing skills
CLR-2 :	Introduce students to Self-analysis techniques like SWOT & TOWS
CLR-3 :	Compile Pluralism & cultural spaces
CLR-4 :	Analyze Cross-cultural communication
CLR-5 :	Apply Science of Nation building
CLR-6 :	Identify the best practices in Communication

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Apply the basic principles of SWOT & life positions.	2	60	50	H	H	H	M	M	L	M	M	L	M	H	L			
CLO-2 :	Analyze & leverage the power of motivation in real life	2	80	70	H	H	L	L	M	M	M	L	L	M	H	H			
CLO-3 :	Identify the common mistakes made in cross-cultural communication	1	80	75	H	H	L	L	M	M	L	L	L	M	H	M			
CLO-4 :	*C* Recognize the roles and relations of different genders.	2	80	70	H	H	M	L	M	M	L	L	L	M	H	H			
CLO-5 :	Identify the best practices of technical writing	3	90	80	H	H	H	L	M	M	L	L	L	M	H	L			
Overall	Differentiate between the diverse culture of India.	3	90	80	H	H	H	M	H	M	H	M	L	H	M	H			

Duration (hour)		6	6	6	6	6
S-1	SLO-1	Guest lecture by a renowned personality to kick start this semester. REUNION Recap activity on the earlier learning after a 6 months break. If we can flash the projects they completed in the last semester End with a Quiz in multiple format rounds testing the objectives.	Rivers of India a. Divide participants into groups of 5. Each group should assign themselves a name from the Indian Rivers. These groups will continue throughout this Unit. b. Learn and Exchange Group activity in which participants need to learn the following four greetings of a state (different from their own) and exchange it with another group: • Good morning • Thank you • Sorry • Good night Indicative only	Role of science in nation building	"Voice of the Future" Activity	Main Project Initiation

Duration (hour)		6	6	6	6	6
	SLO-2	SWOT and Life Positions Meet Dananjaya: Meet DananjayaHettiarachchi The World Champion of Public Speaking 2014 who made the winning speech which was rated amongst the "Most talked-about speeches of 2014". https://www.youtube.com/watch?v=bbz2boNSeL0&t=24s	a. Awareness and respect for pluralism in cultural spaces b. Announce the Rhythms of India activity to be held in the next session. The rules of the activity will be detailed at this point. Teams to prepare for the performance beyond class hours.	Introduce the topic and discuss the role of scientists and mathematicians from ancient India.	How will a voice assistant evolve in 25 years from now? Each group will present a skit.	Select a rural area to visit
S-2	SLO-1	Debrief on the video. How it relates to SWOT.	Rhythms of India (Cultures in India) Group activity: Each group to perform a short dance piece (3mins) from any of the Indian states (to be decided by lots).	Break the students into groups and give them ten minutes to access internet and get information about ten eminent scientists and mathematicians of ancient India. Groups will be given five minutes to present on the next day. Groups will also frame two questions which they will ask after presenting.	AI in Everyday Life Discussion in groups on given topics and then cross sharing of discussion points amongst the groups.	Identify underprivileged parts of city to address some of the local issues
	SLO-2	Intro activity: Give story of an individual* and divide people into 4 groups S W O T and ask them to jot down the SWOT. Start with a different nomenclature (demystifying SWOT)	Rhythms of India (Cultures in India) Group activity: Each group to perform a short dance piece (3 mins) from any of the Indian states (to be decided by lots). They have to present the background and unique features of the dance form (5 min).	This can also be taught through Augmented Reality, where images of the scientists will be put up around the class and they will be able to gather the information by using their phones and AR app.	Design your college in the year 2090	Suggest a practical technology solution to the issues.
S-3	SLO-1	Pat your back activity…strength will be written by others other points by you	a. Global, glocal, translocational Use Ted and YouTube videos to show examples b. Announce debate to be held in the next session. They have to come prepared for the debate/discussion.	Groups present their findings. Other groups note down their learning. At the end there will be a quiz to assess their learning.	Groups need to create the college of future with the future teachers, teaching methods, types of students, etc.	Decide on the sample and form questionnaires to collect data
	SLO-2	Create your SWOT	Debate on Global, glocal, tanslocational impacts (topics to be decided by the faculty or suggested by the students). Debate to be held in the presence of an external moderator. Eight groups will get four topics to debate upon.	Role of science post- independence Groups to present using multiple formats on any one of the four given topics.	We will end the session with the question: How will offices/workplaces change in future? Who do you think would be your colleagues?	Initiate data collection
S-4	SLO-1	SWOT Vs. TOWS The Balancing Act Ted talk on biomimicry: (Only first 8 mins): https://www.youtube.com/watch?v=RHrO4t86phA	Cross-cultural communication A. Verbal and non-verbal communication (approach is through videos). Point out the obvious mistakes. From our perspective…how anyone would feel if someone else made mistakes about our cultures. B. Let participants have a group discussion on the implications of cross cultural communication.	Inventions Inventors Institutes Information technology	Communicating with machines	Analyze the data to find the issues

Duration (hour)		6	6	6	6	6
	SLO-2	Debrief on the Ted talk in which the facilitator gently guides the group towards the understanding that survival happens only when we seek ideas from the external world to turn the threat into opportunity Research on TOWS and find out how you can turn your threat into opportunity. Two people mutually identifying opportunities from each other's threats.	Suggested long-term activity: A VR game in which learners can visit different locations of the world and overcome challenges by using cross cultural skills.	Introduction to technical writing	Theory and Ted talk videos	Recommend strategy for solution formation
S-5	SLO-1	Presentation on what are the strengths they have identified to survive in the VUCA World. Group presentations of 10 mins each.	Culture shock Group activity to perform skits based on situations provided by the lecturer.	Basic rules of technical writing through examples.	Debate in the presence of an external moderator. Will machines control us in future?	Recommend solutions
	SLO-2	Motivation Stories YouTube videos on Maslow's Theory	Gender awareness Participants will view relevant scenarios in the class and then participate in a reflection activity in group. The scenarios can be presented using an Augmented Reality intervention.	Practice activity on technical writing.	Applying technical writing in profession Theory with YouTube and DrBimal Ray's videos. DrBimal Kumar Roy, a former Director of the Indian Statistical Institute, is a cryptologist from the Cryptology Research Group of the Applied Statistics Unit of ISI, Kolkata.	Incorporate diagrams and charts for support
S-6	SLO-1	Scenario based activity on identifying and leveraging motivation	Gender awareness campaign Groups to present the detailed plan of Gender awareness campaigns with four different themes. • College • Workplace • Family • Friends	Assessment on technical writing on the following topic:	Scenario-based Assessment on technical writing	Finalize the report with all the findings and recommendation
	SLO-2	Present their findings and approaches as groups. They need to explain the idea of motivation with the help of examples.	Quiz Time	Explain the following to a visually impaired person: • DNA • Rings of Saturn • Structure of an oxygen atom • Structure of heart	Each group will make a presentation on the following: a) Sell Analytics and Insight to the local tea seller. b) Explain the concept of Cloud to your 87 year old grandmother. c) Introduce the concept of friendly robots to a class 3 kid. Explain IOT to your helping hand at home	Submit the report (Hard Copy)

Learning Resources	1 Examples of Technical Writing for Students : https://freelance-writing.lovetoknow.com/kinds-technical-writing 2 11 Skills of a Good Technical Writer: https://clickhelp.com/clickhelp-technical-writing-blog/11-skills-of-a-good-technical-writer/ 3 13Benefits and challenges of cultural diversity in the workplace: https://www.hult.edu/blog/benefits-challenges-cultural-diversity-workplace/	4 https://youtu.be/CsaTslhSDI 5 https://m.youtube.com/watch?feature=youtu.be&v=IIKvV8_T95M 6 https://m.youtube.com/watch?feature=youtu.be&v=e80BbX05D7Y 7 https://m.youtube.com/watch?v=dT_D68RJ5T8&feature=youtu.be 8 https://m.youtube.com/watch?v=7sLLEdBgYYY&feature=youtu.be

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*40%*	-	*40%*	-	*40%*	-	*40%*	-	*40%*	-
	Understand										
Level 2	Apply	*40%*	-	*40%*	-	*40%*	-	*40%*	-	*40%*	-
	Analyze										
Level 3	Evaluate	*20%*	-	*20%*	-	*20%*	-	*20%*	-	*20%*	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert Member from TCS	**-**	Mr.Vijay Raja, Assistant Professor, SRMSOM Dr.Santhanalakshmi, Head – Human Resources , SRMSOM

Course Code	18MBH363T	Course Name	FUNDAMENTALS OF MANAGEMENT	Course Category	H	Humanities & Social Sciences	L	T	P	C
							2	0	0	2

Pre-requisite Courses	*Nil*	Co-requisite Courses	*Nil*	Progressive Courses	*Nil*
Course Offering Department	*MBA*	Data Book / Codes/Standards	*Nil*		

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*	Learning		
		1	2	3
CLR-1 :	*Gain understanding of the functions and responsibilities of managers.*	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-2 :	*Provide them tools and techniques to be used in the performance of the managerial job.*			
CLR-3 :	*Enable them to analyze and understand the environment of the organization.*			
CLR-4 :	*Help the students to develop cognizance of the importance of management principles.*			
CLR-5 :	Analyse the concepts related to Business.			
CLR-6 :	Demonstrate the roles, skills and functions of management.			

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	Learning			Program Learning Outcomes (PLO)													
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	*Analyze effective application of PPM knowledge to diagnose and solve organizational problems and develop optimal managerial decisions.*	*3*	*80*	*70*	*L*	*H*	-	*H*	*L*	-	-	-	*L*	*L*	-	*H*	-	-	-
CLO-2 :	*Apply the complexities associated with management of human resources in the organizations and integrate the learning in handling these complexities.*	*3*	*85*	*75*	*M*	*H*	*L*	*M*	*L*	-	-	-	*M*	*L*	-	*H*	-	-	-
CLO-3 :	*Recognize the role of a manager and how it relates to the organization's mission*	*3*	*75*	*70*	*M*	*H*	*M*	*H*	*L*	-	-	-	*M*	*L*	-	*H*	-	-	-
CLO-4 :	*Identify the stages of team development and the skills a team must acquire to become effective*	*3*	*85*	*80*	*M*	*H*	*M*	*H*	*L*	-	-	-	*M*	*L*	-	*H*	-	-	-
CLO-5 :	*Recognize the part communication plays in the management function.*	*3*	*85*	*75*	*H*	*H*	*M*	*H*	*L*	-	-	-	*M*	*L*	-	*H*	-	-	-
CLO-6 :	*Compile critical management theories and philosophies and how to apply them.*	*3*	*80*	*70*	*L*	*H*	-	*H*	*L*	-	-	-	*L*	*L*	-	*H*	-	-	-

Duration (hour)		6	6	6	6	6
S-1	SLO-1	*Introduction to management*	*Nature and purpose of planning*	Nature and purpose of Organizing& staffing	*Foundations of individual and group behavior*	Elements of Managerial Control,
	SLO-2	*Introduction to concept of management*	*planning process*	Formal and informal organization	*motivation*	Control Systems, Management Control Techniques
S-2	SLO-1	*Definition of Management*	*types of planning*	organization chart	*motivation theories*	Effective Control Systems,
	SLO-2	*Management functions (planning, organizing, staffing, directing, coordinating, controlling)*	*objectives*	organization structure & type	*motivational techniques*	System and process of controlling
S-3	SLO-1	*Management & Administration*	*setting objectives*	Line and staff authority, Span of Management	*job satisfaction*	budgetary and non-budgetary control techniques
	SLO-2	*Nature of management (management as art, science and profession*	*policies*	Departmentalization, Delegation, delegation of authority	*job enrichment*	use of computers and IT in Management control
S -4	SLO-1	*types of managers -managerial roles and skills Evolution of Management*	*Planning premises*	Bases of Delegation, Kinds of Delegation	*leadership*	direct and preventive control
	SLO-2					
S-5	SLO-1	*The scientific management school (Taylor)*	*Strategic Management*	Centralization and Decentralization	*types and theories of leadership*	Coordination Concept, Importance, Principles and Techniques of Coordination

	SLO-2	*The scientific management school (Taylor)*	*Planning Tools and Techniques*	Methods of Decentralization	*Communication, process of communication*	Coordination Concept, Importance, Principles and Techniques of Coordination
S-6	SLO-1	*The management process school (Fayol's Principles of Management*	*Decision making steps and process.*	Definition of staffing,	*barrier in communication,*	Concept of Managerial Effectiveness
	SLO-2	*Current trends and issues in Management.*	*Decision making steps and process.*	Factors affecting staffing, Recruitment and Selection	*Effective communication, communication and IT.*	Concept of Managerial Effectiveness

Learning Resources	1. R D Agrawal, Organization and Management, New Delhi, Tata McGraw Hill, 1990. 2. Harold Koontz and Heinz Weihrich, Essentials of management, McGraw Hill, 5th edition. 3. T N Chhabra, Principle and Practice of management, Dhanpat Rai & Sons.	4. Stephen P Robins and Mary Coulter, Management, Pearson publications, 7th edition. 5. L.M. Prasad, Principles & Practice of Management, S. Chand & Sons, 2005

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*40%*	-	*40%*	-	*40%*	-	*40%*	-	*40%*	-
	Understand										
Level 2	Apply	*40%*	-	*40%*	-	*40%*	-	*40%*	-	*40%*	-
	Analyze										
Level 3	Evaluate	*20%*	-	*20%*	-	*20%*	-	*20%*	-	*20%*	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert Member from TCS	-	*Dr.N.Santhosh Kumar – SRMIST* *Dr.S.Sujatha – SRMIST* *Dr.Celina - SRMIST*

Course Code	18MBH364T	Course Name	BUSINESS STRATEGY	Course Category	H	Humanities & Social Sciences	L	T	P	C
							2	0	0	2

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	College of Management	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	Define strategic decision making ability in prevailing situations			
CLR-2 :	Identify the environmental strategic factors for industry analysis			
CLR-3 :	Plan the organizational structures and to implement, evaluate and control the process			
CLR-4 :	Classify the organization and to formulate the strategy			
CLR-5 :	Analyse the strategic change and issues prevailing in the organization			
CLR-6 :	Create sustainable competitive advantage to the organization			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Apply the conceptual knowledge of strategic management for incorporating strategic decisions	3	80	70	M	M	M	M	M	M	-	-	M	M	L	M	-	-	-
CLO-2 :	Analyze the organization and to formulate the strategy for the organization	3	85	75	M	H	L	M	L	-	-	-	M	L	-	H	-	-	-
CLO-3 :	Analyze and exhibit the various environmental factors	3	75	70	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-4 :	Implement, evaluate and control the process in an organization	3	85	80	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-5 :	Develop appropriate control methods to support specific strategic Actions	3	85	75	H	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-6 :	Construct Business Strategies based on organizational analysis	3	80	70	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-

Duration (hour)		6	6	6	6	6
S-1	SLO-1	Introduction to Strategicmanagement	Core and distinctive competencies	Identifying external environmental variables	Strategy implementation	Strategic change
	SLO-2	Phases of Strategic management	Competitive advantage and firm resources	Identifying external strategic factors	Process of implementation	Disruptive innovation
S-2	SLO-1	Basic Strategic Management Model	Generic strategies and competitive advantage	Analyzing the Task environment	Stages of corporate development	Developing an innovative entrepreneurial culture
	SLO-2	Strategic Intent- Introduction on Mission, Vision, Objectives , goals, strategies and policies	Determining the sustainability of an advantage	Porter's approach to industry analysis	Organizational Life Cycle and Types of Organizational structures	Corporate social responsibility
S-3	SLO-1	Internal environmental strategic factors	Competing through business models	Stake holder analysis	Process of evaluation and control	Competitive advantage on strategic management
	SLO-2	External environmental strategic factors	Industry value chain analysis	Non-market strategy	Types of control	Competitive advantage to corporate advantage
S-4	SLO-1	Strategy formulation Process of Strategy Formulation	Scanning functional resources and capabilities VRIO Framework	Categorizing international Industries Strategic Types	Techniques of control	Integrative analysis, Strategic issues of specific sectors
	SLO-2					
S-5	SLO-1	Evaluation, control and feedback / Learning process	Generic strategies	Competitive intelligence	Competitive advantage to corporate advantage	Small business organizations
	SLO-2	Impact of globalization	Product Life Cycle	Monitoring competitors for strategic planning	Corporate governance and corporate ethics	Factors affecting venture's success

S-6	SLO-1	Globalization – Challenges to strategic management	Portfolio analysis corporate parenting	Core and Distinctive Competitive advantage	Strategic issues in implementation	Responsibilities of the Board
	SLO-2	Mintzberg's modes of strategic decision making	Functional strategy, strategic choice and grand strategy	Porters 5 Forces Model	Strategic issues in evaluation and control	Carroll's four Social responsibilities of business

Learning Resources	1. *Fitzsimmons & Fitzsimmons, Service Management: Operations, Strategy, Information Technology, McGraw Hill publications (9th edition), 2019* 2. *Exploring Strategy-Text & Cases, Richard Whittington, Patrick Regnér , Duncan Angwin, Gerry Johnson , Kevan Scholes, Pearson, 2019 (12th Ed.)* 3. *Strategic Management, Azar Kazmi,McGraw Hill, 2015, (4th Ed.)* 4. *Wilson, A., Zeithaml, V. A., Bitner, M. J., & Gremler, D. D. (2012). Services marketing: Integrating customer focus across the firm. McGraw Hill.* 5. *Lovelock, C. (2011). Services Marketing, 7/e. Pearson Education India*	6. *Reason, Ben, and Lovlie, Lavrans, (2016) Service Design for Business: A Practical Guide to Optimizing the Customer Experience, Pan Macmillan India* 7. *Chesbrough, H. (2010). Open services innovation: Rethinking your business to grow and compete in a new era. John Wiley & Sons*

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*40%*	-	*40%*	-	*40%*	-	*40%*	-	*40%*	-
	Understand										
Level 2	Apply	*40%*	-	*40%*	-	*40%*	-	*40%*	-	*40%*	-
	Analyze										
Level 3	Evaluate	*20%*	-	*20%*	-	*20%*	-	*20%*	-	*20%*	-
	Create										
	Total	100 %		100 %		100 %		100 %		100%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert Member from TCS	-	*Dr.K.Sadasivan, SRMIST* *Dr.P.S.Rajeswari, SRMIST*

Course Code	18CSC361J	Course Name	Design and Analysis of Algorithms	Course Category	C	Professional Core	L	T	P	C
							3	0	2	4

Pre-requisite Courses	*Nil*	Co-requisite Courses	*Nil*	Progressive Courses	*Nil*
Course Offering Department	*Computer Science and Business Systems*	Data Book / Codes/Standards	*Nil*		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	Apply different algorithms to solve problems in an efficient way
CLR-2 :	Design algorithms with minimum time complexity to solve complex problems
CLR-3 :	Demonstrate different algorithmic strategies to solve different complexity class problems
CLR-4 :	Tackle Graph and Tree related real life problems.
CLR-5 :	Analyze relations between P-Type, NP Type, NP Complete, NP Hard problems
CLR-6 :	Construct approximation algorithms for very large complexity class problems.

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Identify various time complexity classes with respect to asymptotic notations.	3	80	70	H	H	H	H	M	L	-L	-M	H	M	L	H	-	-	-
CLO-2 :	Organise various algorithmic strategies	3	85	75	M	H	H	M	L	L	L	L	M	L	L	H	-	-	-
CLO-3 :	Apply Graphs and Tree data structure to solve real life problems	3	75	70	H	H	H	H	L	L	L	L	M	L	L	H	-	-	-
CLO-4 :	Differentiate between Tractable and Intractable problems	3	85	80	M	H	M	H	L	L	L	L	M	L	L	H	-	-	-
CLO-5 :	Evaluate randomized algorithms and approximation algorithms to solve large complexity classes	3	85	75	H	H	M	H	L	L	L	L	M	L	L	H	-	-	-
CLO-6 :	Classify various problems to different complexity classes	3	80	70	L	H	-	H	L	L	L	L	L	L	L	H	-	-	-

Duration (hour)		15	15	15	15	15
S-1	SLO-1	Introduction-Characteristic of Algorithm	Fundamental Algorithmic Strategies	Basic Traversal Algorithms-Introduction	Tractable algorithms- In-Tractable algorithms	Advanced Topics
	SLO-2	Analysis of Algorithm with an example	Continued	Continued	Various Examples	Continued.
S-2	SLO-1	Asymptotic analysis of algorithms	Brute Force Method-Heuristics	Tree Traversal	Computability of algorithms	Approximation Algorithm
	SLO-2	Continued	Few examples	Binary Tree- In order Tree traversal	Turing Machine(Small introduction)	An example-Knapsack Problem
S-3	SLO-1	Various asymptotic notations-O, o, θ,ω,Ω	Greedy approach	Pre order Tree traversal	Computability Classes	Absolute Approximation
	SLO-2	Continued with examples.	Single Source Shortest path	Post Order Tree Traversal	Simple examples	Continued
S 4-5	SLO-1	Lab 1: Implementation of Insertion sort algorithm. Time complexity analysis	Lab4 :Implementation of Single Source Shortest path	Lab 7: Implementation of various tree traversals.	Lab10: Implementation of a P-Type problem	Lab 13: Implementation of Longest Processing Times.
	SLO-2					
S-6	SLO-1	Algorithms – Insertion sorting-Best case, analysis	Dynamic Programming Paradigm	Tree Traversal- Breadth First Search	P-Type Problem	Polynomial approximation algorithm-Introduction
	SLO-2	Average case, and Worst case analysis	Knapsack Problem	An example to be discussed	Simple Examples	Continued
S-7	SLO-1	Performance measure of algorithms	All pairs shortest problem	Tree Traversal- Depth First Search	NP-Type Problem	Randomized algorithm-Introduction
	SLO-2	Time and Space Complexity trade-off	Continued	An example to be discussed	Simple Examples	Basics of Probability
S-8	SLO-1	Recursive Algorithms	Dynamic Programming-Travelling salesman problem	Graph Traversals-Introduction	Problem Reduction	Randomized algorithm-Quicksort

Duration (hour)		15	15	15	15	15
	SLO-2	Example	Continued	Shortest Path Algorithms- Topological Sorting	Polynomial Reduction	Continued
S 9-10	SLO-1	Lab 2: Implementation of Maximum and Minimum in an array-Using different strategies	Lab 5: Implementation of Knapsack problem using Dynamic Programming approach	Lab 8: Implementation of BFS and DFS	Lab 11: Implementation of NP Type problem	Lab 14:Implementation of Randomized Quick sort
	SLO-2					
S-11	SLO-1	Recurrence relations-Various strategies to solve	Backtracking Technique	Transitive Closure- Floyd Warshall algorithm	NP-Complete type	Class of problem beyond NP=PSPACE
	SLO-2	Simple Example	4 Queen's Problem	An example	Examples	Continued
S-12	SLO-1	Substitution Method of solving recurrence relations,	Backtracking Technique-Sum subset Problem	Minimum Spanning tree-Prim's and Kruskal algorithm	Cook's Theorem	Continued
	SLO-2	Recursion Tree method	Branch and Bound technique-Knapsack Problem	An example	Discussion	Introduction to Quantum Algorithms
S-13	SLO-1	Master Theorem	Travelling Sales person Problem	Network Flow algorithm	NP Hard Problems	Continued
	SLO-2	Few examples	Continued	Continued	Simple examples	-Continued--
S 14-15	SLO-1	Lab 3: Recursive algorithm –Towers of Hanoi Problem	Lab 6: Implementation of Travelling sales person problem by branch and bound technique	Lab9: Implementation of Minimum Spanning Tree	Lab 12: An NP Complete type problem. Travelling salesman problem	Lab 15 :Implementation of NP Complete problem
	SLO-2					

Learning Resources	1. *E.Harowitz and Sahni, Fundamentals of algorithms, University press,2nd edition 2008* 2. *A.V.Aho, J.E Hopcroft , J.D.Ullman, Design and analysis of computer algorithms, Addison and Wesley 1974* 3. *T.Coremann, C.H.Leisersion,R.L.Rivest and Clifford Stein, Introduction to algorithms,PHI ,3rd edition 2010*	4. *Sara Baase, Allen Van Gelder, Computer algorithms: Introduction to Design and analysis, Pearson 3rd Edition 1999* 5. *Michael A. Nielsen and Isaac L. Chuang, Quantum computation and Quantum Information, Cambridge University Press,2010*

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Understand										
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze										
Level 3	Evaluate	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert Member from TCS	-	*Dr.K.Senthil Kumar, SRMIST*

Course Code	18CSC362J	Course Name	COMPILER DESIGN	Course Category	C	Professional Core	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Engineering	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	Analyse the various phases of compiler.			
CLR-2 :	Apply various parsing techniques.			
CLR-3 :	Illustrate intermediate code generation.			
CLR-4 :	Implement front-end of the compiler.			
CLR-5 :	Develop a Code Generator			
CLR-6 :	Incorporate different Code optimization technique			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	Apply the mathematics and engineering principles for the Design of Compilers	3	80	70
CLO-2 :	Express the knowledge of Lexical Analyzer from a specification of a language's lexical rules	3	85	75
CLO-3 :	Create a Syntax Analyzer for parsing the sentences in a compiler grammar	3	75	70
CLO-4 :	Demonstrate various intermediate codes	3	85	80
CLO-5 :	Analyze the methods of implementing a Code Generator for compilers	3	85	75
CLO-6 :	Design the methods of developing a Code Optimizer	3	80	70

	Program Learning Outcomes (PLO)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	H	M	M		-	-	-	-	-	-	-	-	-	-	H
CLO-2 :	-	H	H	L	-	-	-	-	-	-	-	-	-	-	H
CLO-3 :	-	H	H	L	-	-	-	-	-	-	-	-	-	-	H
CLO-4 :	-	H	H	H	-	-	-	-	-	-	-	-	-	-	H
CLO-5 :	-	H	H	M	-	-	-	-	-	-	-	-	-	-	H
CLO-6 :	-	H	H	H	-	-	-	-	-	-	-	-	H	-	H

Duration (hour)		15	15	15	15	15
S-1	SLO-1	*The structure of a compiler*	*Syntax Analysis Definition - Role of parser*	*Bottom Up Parsing*	*Syntax-Directed Definition: Inherited and Synthesized Attributes*	*One-Pass Code Generation Using Backpatching*
	SLO-2	*Phases of a compiler – Cousins of the Compiler*	*Lexical versus Syntactic Analysis*	*Reductions*	*Evaluating an SDD at the Nodes of a Parse Tree*	*Backpatching for Boolean Expressions*
S-2	SLO-1	*Grouping of Phases – Compiler construction tools*	*Representative Grammars*	*Handle Pruning*	*Dependency Graphs*	*Translation of Switch-Statements*
	SLO-2	*Lexical Analysis – Role of Lexical Analyzer*	*Syntax Error Handling*	*Shift Reduce Parsing*	*Ordering the Evaluation of Attribute*	*Syntax-Directed Translation of Switch-Statements*
S-3	SLO-1	*Input Buffering*	*Elimination of Ambiguity, Left Recursion*	*Problems related to Shift Reduce Parsing*	*S-Attributed Definitions*	*Storage Organization*
	SLO-2	*Lex : Programming*	*Left Factoring*	*Conflicts During Shift Reduce Parsing*	*L-Attributed Definitions*	*Stack Allocation of Space: Activation Tree, Activation Records*
S 4-5	SLO-1	*Lab 1: Implementation of symbol table.*	*Lab 4 Construction of DFA from NFA*	*Lab 7 - Shift Reduce Parsing*	*Lab 10- Convert the bnf rules into yacc form and write code to generate abstract syntax tree.*	*Lab 13 Implement control flow analysis and data flow analysis.*
	SLO-2					
S-6	SLO-1	*Simple Lex program, Recognizing words with lex*	*Top down parsing*	*LR Parsers- Why LR Parsers*	*Applications of Syntax-Directed Translation Construction of Syntax Trees*	*Access to Nonlocal Data on the Stack:Data Access Without Nested Procedure*

Duration (hour)		15	15	15	15	15
	SLO-2	*Finite automation - deterministic*	*Recursive Descent Parsing, back tracking*	*Items and LR(0) Automaton, Closure of Item Sets,*	*Variants of Syntax Trees : DAG Construction*	*A Language With Nested Procedure Declarations*
S-7	SLO-1	*Finite automation - non deterministic*	*Computation of FIRST*	*LR Parsing Algorithm*	*Three-Address Code*	*Heap Management:The Memory Manager*
	SLO-2	*Conversion of NFA to DFA*	*Problems related to FIRST*	*Operator Precedence Parser Computation of LEADING*	*Types and Declarations :Type Expressions*	*Issues in the Design of a Code Generator*
S-8	SLO-1	*Regular Expressions*	*Computation of FOLLOW*	*Computation of TRAILING*	*Type Expressions, Declarations*	*The Target Language*
	SLO-2	*Conversion of regular expression to NFA – Thompson's*	*Problems related to FOLLOW*	*Problems related to LEADING AND TRAILING*	*Storage Layout for Local Names*	*Basic Blocks and Flow Graphs*
S 9-10	SLO-1	*Lab 2: Implementation of lexical analyzer using lex tool.*	*Lab 5 - FIRST AND FOLLOW computation*	*Lab 8- Computation of LEADING AND TRAILING*	*Lab 11 Implementation of DAG*	*Lab 14 : Implement any one storage allocation strategies(heap, stack, static)*
	SLO-2					
S-11	SLO-1	*Converting Regular expression directly to DFA*	*Construction of a predictive parsing table*	*SLR Grammars*	*Translation of Expressions: Operations Within Expressions*	*Optimization of Basic Blocks: The DAG Representation of Basic Blocks*
	SLO-2	*Minimization of DFA*	*Predictive Parsers LL(1) Grammars*	*SLR Parsing Tables*	*Addressing Array Elements Translation of Array References*	*Finding Local Common Subexpressions*
S-12	SLO-1	*Yacc programming*	*Transition Diagrams for Predictive Parsers*	*Problems related to SLR*	*Type Checking : Rule for Type checking, Type conversion*	*Dead Code Elimination*
	SLO-2	*Yacc parser,Rules section*	*Error Recovery in Predictive Parsing*	*Construction of Canonical LR(1) and LALR*	*Control Flow: Boolean Expressions*	*Reassembling Basic Blocks From DAG's*
S-13	SLO-1	*Running Yacc,*	*Predictive Parsing Algorithm*	*Construction of LALR*	*Short-circuit Code*	*A Simple Code Generator*
	SLO-2	*Grammar implementation in Yacc*	*Non Recursive Predictive Parser*	*Problems related to Canonical LR(1) and LALR Parsing Table*	*Flow-of- Control Statements*	*Peephole Optimization*
S 14-15	SLO-1	*Lab 3: Construction of NFA from REGULAR EXPRESSION*	*Lab 6 Predictive Parsing Table*	*Lab9 Computation of LR(0) items*	*Lab 12 : Implement type checking*	*Lab 15: Implement the back end of the compiler which takes the three address code and produces the 8085 assembly language instructions that can be assembled and run using a 8085 assembler. The target assembly instructions can be simple with ADD,SUB commands.*
	SLO-2					

Learning Resources	1. *AlfredVAho,JefferyDUllman,RaviSethi,"Compilers,Principlestechniquesandtools",Pearson Education2011* 2. *S.GodfreyWinster,S.ArunaDevi,R.Sujatha,"CompilerDesign",YesdeePublishingPvt.Ltd,2016* 3. *WilliamM.WaiteandGerhardGoos.CompilerConstruction.Springer-Verlag,New York,2013.*	4. *K.Muneeswaran,,"CompilerDesign",OxfordHigherEducation,Fourthedition 2015* 5. *DavidGalles,"ModernCompilerDesign",PearsonEducation,Reprint2012.* 6. *RaghavanV.,"PrinciplesofCompilerDesign",TataMcGrawHillEducationPvt.Ltd.,2010* 7. *Levine, J. R., Mason, J., Levine, J. R., Mason, T., Brown, D., Levine, J. R., & Levine, P. (1992). Lex & yacc. " O'Reilly Media, Inc.".*

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Understand										
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze										
Level 3	Evaluate	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert Member from TCS	-	*Dr R I Minu, SRMIST*

Course Code	18PDM301L	Course Name	ANALYTICAL AND LOGICAL THINKING SKILLS	Course Category	M	*Mandatory*	L	T	P	C
							0	0	2	0

Pre-requisite Courses	*Nil*	Co-requisite Courses	*Nil*	Progressive Courses	*Nil*
Course Offering Department	*Career Development Centre*	Data Book / Codes/Standards	*Nil*		

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*	Learning		
		1	2	3
CLR-1 :	*Recapitulate fundamental mathematical concepts and skills*	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-2 :	*Sharpen logical reasoning through skillful conceptualization*			
CLR-3 :	*Enable to solve problems and to crack competitive exams.*			
CLR-4 :	*understand and master the mathematical concepts to solve types of problem*			
CLR-5 :	*identify problems*			
CLR-6 :	*give the right knowledge, skill and aptitude to face any competitive examination*			

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1 :	*build a strong base in the fundamental mathematical concepts*	*1*	*80*	*75*	*L*	*H*		*M*					*M*	*L*		*H*			
CLO-2 :	*Apply the learn conditions towards solving problems analytically*	*1*	*80*	*75*	*L*	*H*		*M*					*M*	*L*		*H*			
CLO-3 :	*grasp the approaches and strategies to solve problems with speed and accuracy*	*2*	*80*	*75*	*L*	*H*		*M*					*M*	*L*		*H*			
CLO-4 :	*Collectively solve problems in teams and groups*	*2*	*80*	*75*	*L*	*H*		*M*					*M*	*L*		*H*			
CLO-5 :	*solve problems*	*1*	*80*	*75*	*L*	*H*		*M*					*M*	*H*		*H*			
CLO-6 :	*gain appropriate skills to succeed in preliminary selection process for recruitment*	*3*	*80*	*75*	*L*	*H*		*M*					*M*	*H*		*H*			

Duration (hour)		6	6	6	6	6
S-1	SLO-1	*Arithmetic Progression*	*Clocks*	*Time, Speed, Distance*	*Geometry - Triangles*	*Data sufficiency Introduction*
	SLO-2	*Solving Problems*	*Solving Problems*	*Solving Problems*	*Geometry – Lines and Angles*	*Data sufficiency Type 1*
S-2	SLO-1	*Geometric Progressions*	*Calendar*	*Time, Speed, Distance-Races*	*Geometry - Circles*	*Data sufficiency Type 2*
	SLO-2	*Harmonic Progression*	*Solving Problems*	*Solving Problems*	*Solving Problems*	*Solving Problems*
S-3	SLO-1	*Averages*	*Ratio*	*Problems on Trains*	*Mensuration Area*	*Data Interpretation - Introduction*
	SLO-2	*Solving Problems*	*Proportion*	*Solving Problems*	*Solving Problems*	*Data Interpretation - Table*
S-4	SLO-1	*Weighted Averages*	*Variation*	*Boats & Streams*	*Mensuration – Volume and Surface Area*	*Data Interpretation - Pie Chart*
	SLO-2	*Solving Problems*	*Solving Problems*	*Solving Problems*	*Solving Problems*	*Data Interpretation - Line Graphs*
S-5	SLO-1	*Sets Two Variables*	*Mixtures & Solutions*	*Time and work*	*Trigonometry- Identities*	*Data Interpretation – Bar Graphs*
	SLO-2	*Sets Three Variables*	*Solving Problems*	*Solving Problems*	*Solving Problems*	*Solving Problems*
S-6	SLO-1	*Functions*	*Allegation Method*	*Pipes and Cisterns*	*Trigonometry - Height and Distances*	*Revision I*
	SLO-2	*Graphs*	*Solving Problems*	*Solving Problems*	*Solving Problems*	*Revision II*

Learning Resources		
	1. *Abhijit Guha, Quantitative Aptitude for Competitive Examinations,Tata McGraw Hill, 3rd Edition, 2011*	4. *Edgar Thrope, Test of Reasoning for Competitive Examinations, Tata McGraw Hill, 4th Edition, 2012*
	2. *Arun Sharma-Quantitative aptitude for CAT, Tata McGraw Hill*	5. *Archana Ram, Placementor, Oxford University Press,2018*
	3. *Dinesh Khattar-The Pearson Guide to QUANTITATIVE APTITUDE for competitive examinations.*	6. *P.A.Anand, Quantitative Aptitude for Competitive Examinations, Wiley Publication, 2016*

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (100% weightage)								Final Examination	
		CLA – 1 (20%)		CLA – 2 (30%)		CLA – 3 (30%)		CLA – 4 (20%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	-	*40%*	-	*30%*	-	*30%*	-	*30%*	-	-
	Understand										
Level 2	Apply	-	*40%*	-	*40%*	-	*40%*	-	*40%*	-	-
	Analyze										
Level 3	Evaluate	-	*20%*	-	*30%*	-	*30%*	-	*30%*	-	-
	Create										
	Total	100 %		100 %		100 %		100 %		-	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Mr Nishith Sinh, *dueNorth India Academics LLP, Dehradun, nsinha.alexander@gmail.com*		1. Dr.P.Madhusoodhanan SRMIST
2. Mr Ajay Zenne, Career Launcher, *ajay.z@careerlauncher.com*		2. Dr.M.Snehalatha SRMIST
3. *Mr.Pratap Iyer, Study Abroad Mentors, Mumbai, pratap.iyer30@gmail.com*		3. Mr Murali K SRMIST
		4. Mr.Harinarayana Rao SRMIST

Course Code	18LEM109T	Course Name	INDIAN TRADITIONAL KNOWLEDGE	Course Category	M	*Mandatory*	L	T	P	C
							1	0	0	0

Pre-requisite Courses	*Nil*	Co-requisite Courses	*Nil*	Progressive Courses	*Nil*
Course Offering Department	*English and Foreign Languages*	Data Book / Codes/Standards	*Nil*		

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*	Learning		
		1	2	3
CLR-1 :	*Introduce the learners to the early and traditional environmental friendly agricultural practices*	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-2 :	*Enable the students to recognize and appreciate the contribution of India to astronomical studies*			
CLR-3 :	*Draw the learner's attention towards the holistic approach behind Indian system of medicine*			
CLR-4 :	*Cultivate a sense of appreciation about ancient Indian Engineering and Technology as diverse, culture and resource specific*			
CLR-5 :	*Develop an understanding about the connection of daily life to the environment and a healthy lifestyle through a comparison of the linguistic phrases and sayings and analyzing them from today's science*			

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	*equip with an awareness of the ancient India's eco consciousness and India's contribution to astronomy and the beliefs associated with it*	*3*	*90*	*85*
CLO-2 :	*appreciate the Indian aesthetic sensibility which is evidenced in the architectural monuments, economic life and religious worship*	*3*	*90*	*85*
CLO-3 :	*understand how Indians have had a holistic approach towards human life integrating the body, mind and soul*	*3*	*90*	*85*

Program Learning Outcomes (PLO)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	-	-	-	-	-	*H*	*H*	*H*	*H*	*H*	-	*H*	-	-	-
CLO-2 :	-	-	-	-	*L*	*H*	*M*	*M*	*H*	*H*	-	*H*	-	-	-
CLO-3 :	-	-	-	-	-	*H*	*H*	*H*	*H*	*H*	-	*H*	-	-	-

Duration (hour)		Agriculture	Mathematics & Astronomy	Medicine	Engineering & Technology	Customs, Sayings And Life Truths
S-1	SLO-1	*Early agricultural settlements - Influencing Factors – locale and climate*	*Concepts of time and space - Knowledge of the Universe*	Introduction to the school of Ayurveda, Siddha and Naturopathy:	*Architecture – Temples, forts, palaces, houses and town planning*	Regional myths, beliefs,,and cultural practices
	SLO-2	Locating the early agricultural settlements in the Indian map and indicating the timeline	Quiz based on the Indian concept of time and distance between the planets	Compare and Contrast of the methodologies, popular beliefs, myths and truths about medications	Group Discussions through examples from different historical periods and geographical locations	*Noting the idioms, proverbs in mother tongues connected to seasons and festivals*
S-2	SLO-1	*Crop cultivation - Community based Environment friendly practices*	*Great astronomers and mathematicians of ancient India*	*Common features - Holistic Therapeutic Approach – Natural elements, individual constitution (Humours), and the balance recommended*	*Metallurgy – Coins, Traditional Indian Metal Carvings*	*Traditional Foods of India in accordance with the climate and availability of the resources*
	SLO-2	Group presentations on the traditional agricultural practices in selected states	The respective contributions of Astronomers and Mathematicians	Understanding the rationale behind selected sample treatments provided or advised, Case Studies	Discussions on historical periods and their architectural influences	*Collecting old sayings in specific regions of India*
S-3	SLO-1	Ancient Indian Water management and irrigation methods	*The planetary system and Indian Astrology: Basic Facts*	*Yoga and its Universal Appeal*	*Textile technology – Region / Culture specific Fiber, Fabric and weaving*	*Translating Regional sayings into English*
	SLO-2	A region based study of natural water resources and aquifers and types of irrigation	*Discussion on a few sample birth charts and predictions made*	Discussions on worldwide popularity of Yoga and meditation	Comparing the Temple Architecture of North and Southern Indian States	*Traditional sayings about Hygiene and practices pertaining to them*

Learning Resources	1. *V. Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, Bharatiya Vidya Bhavan, Mumbai. 5th Edition, 2014.* 2. *Basham, A.L. ed. A Cultural History of India. OUP, 1997.*	3. *Thapar, Romila. Indian Cultures as Heritage: Contemporary Past. Aleph Book Company, 2018.* 4. *GN Jha (Eng. Trans.), Ed. RN Jha, Yoga-darshanam with Vyasa Bhashya, Vidyanidhi Prakashan, Delhi 2016.*

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (100% weightage)								Final Examination	
		CLA – 1 (20%)		CLA – 2 (30%)		CLA – 3 (30%)		CLA – 4 (20%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*40%*	-	*30%*	-	*30%*	-	*30%*	-	-	-
	Understand										
Level 2	Apply	*40%*	-	*40%*	-	*40%*	-	*40%*	-	-	-
	Analyze										
Level 3	Evaluate	*20%*	-	*30%*	-	*30%*	-	*30%*	-	-	-
	Create										
	Total	100 %		100 %		100 %		100 %		-	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts

SEMESTER - VI

Course Code	18MBH362T	Course Name	BUSINESS COMMUNICATION & VALUE SCIENCE – IV	Course Category	*H*	*Humanities and Social Sciences*	L	T	P	C
							2	0	0	2

Pre-Requisite Courses	Nil	Co-Requisite Courses	*Nil*	Progressive Courses	*Nil*
Course Offering Department	MBA	Data Book / Codes/Standards			

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*
CLR-1 :	Understand the importance of diversity in workplace
CLR-2 :	Apply communicative writing in real life scenarios
CLR-3 :	Recognize the importance of corporate social responsibility (CSR)
CLR-4 :	Label the attributes needed to function and grow in a corporate environment
CLR-5 :	Integrate knowledge of multiple intelligences and learning styles in interpersonal interactions
CLR-6 :	Identify the best practices to manage stress

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Recognize the best practices of communicative writing	2	60	50	H	H	H	M	M	L	M	M	L	M	H	L			
CLO-2 :	Apply emotional intelligence in real life scenarios	2	80	70	H	H	L	L	M	M	M	L	L	M	H	H			
CLO-3 :	Define the importance of corporate social responsibility (CSR)	1	80	75	H	H	L	L	M	M	L	L	L	M	H	M			
CLO-4 :	Recognize the best practices to share and receive feedback	2	80	70	H	H	M	L	M	M	L	L	L	M	H	H			
CLO-5 :	Identify the best time management practices	3	90	80	H	H	H	L	M	M	L	L	L	M	H	L			
CLO-6 :	Gain Knowledge in techniques of business communication and succeed in effective implementation in the corporate arena.	3	90	80	H	H	H	M	H	M	H	M	L	H	M	H			

Duration (hour)		6	6	6	6	6
S-1	SLO-1	Recapitulation activity	Recognize the importance of corporate social responsibility (CSR)	Recognize the attributes needed to function and grow in a corporate environment	Apply knowledge of multiple intelligences and learning styles in interpersonal interactions	Identify the best practices to manage stress
	SLO-2	Understand the importance of diversity in workplace	Corporate Social Responsibility (CSR)-Concepts	Activity –Who am I? (Image Management. Building a perfect image)	Sensitivity to diversity - Quiz	Tips to manage stress
S-2	SLO-1	Identify the key aspects of communicative writing	Recognize some of the stalwarts in CSR	Why is it important to fill the gap (connect to importance of personal branding to stay relevant)	Recognize the impact of conflicts	List of Stress and Group activity
	SLO-2	Apply communicative writing in real life scenarios	Hearing CSR stories	Examples of personal branding in the corporate world, as mentioned in the content	Understanding conflicts	Each group will present their posters and the class will come up with a list of stress management tips to be put up on the Fb/Insta page.
S-3	SLO-1	Use charts and graphs in communicative writing	Recognize the importance of corporate social responsibility (CSR)	Recognize the best practices to share and receive feedback	List the basic guidelines required to manage conflicts	Recognize the importance of time management

Duration (hour)		6	6	6	6	6
	SLO-2	Understand what is emotional intelligence	Telling a CSR story	Examination Result Activity - Locus of control	Tips to manage conflicts	Importance of Time Management for Better Life Style (3:33 mins)
S-4	SLO-1	Recognize the importance of emotional intelligence in personal and professional lives	Recognize the attributes needed to function and grow in a corporate environment	Activity for applying Emotional Intelligence using scenarios within each start-up group.	Recognize the key features of corporate etiquette	Watch YouTube Video sharing information
	SLO-2	Understand why you would need public speaking at your workplace	Attributes required for work and life	Separate scenarios for each group.	Corporate etiquette	open house discussion, where the participants will share their challenges to manage time.
S-5	SLO-1	Identify the best practices of public speaking	Qualities of a good team member:	Apply emotional intelligence in real life scenarios	Recognize the business idioms and corporate terms Apply the business idioms and corporate terms	Identify the best time management practices
	SLO-2	Apply public speaking in real life scenarios	a) Resilience b) Flexibility c) Strategic thinking and planning	Judge the groups based on guidelines provided	Business idioms and Corporate Terms	A valuable lesson for a happy life (2:33 mins)
S-6	SLO-1	Get, Set, Go – sell your start-up ideas	d) Decision making e) Resolving conflicts	Short Session on Activity	Recognize the impact of stress in life and work	Time Squared Activity:
	SLO-2	Activity	Examples and non-examples and then the participants to identify the traits that set them apart.	Group activity	Managing Stress	Self-Evaluation Exercises

Learning Resources		
	1. Emotional Intelligence: Why it Can Matter More Than IQ by Daniel Goleman.	3. How to Develop Self Confidence and Improve Public Speaking - Time - Tested Methods of Persuasion by Dale Carnegie.
	2. Putting Emotional Intelligence to work by Rybak David	4. Ted talks: The Official TED guide to Official Speaking: Tips and Tricks for giving unforgettable speeches and Presentations.

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30	-	30	-	30	-	40	-	30	-
	Understand										
Level 2	Apply	40	-	40	-	40	-	30	-	40	-
	Analyze										
Level 3	Evaluate	30	-	30	-	30	-	30	-	30	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions I	Internal Experts
Expert Member from TCS	-	Dr. Sujatha.S, Associate Professor, SRMIST Dr. Santhana Lakshmi, Head – Human Resources, SRMIST

Course Code	18MBH365T	Course Name	FINANCIAL AND COST ACCOUNTING	Course Category	H	Humanities and Social Sciences	L	T	P	C
							2	0	0	2

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	College of Management	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	Discuss the foundations of accounting and accounting cycle
CLR-2 :	Gain knowledge on the basics of statutory financial statements and their preparation
CLR-3 :	Provide knowledge on the tools and techniques to analyze and interpret financial statements
CLR-4 :	Acquire knowledge on Cost accounting systems
CLR-5 :	Introduce the techniques of marginal costing and budgetary control
CLR-6 :	Understand and decode the corporate annual reports

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Acquire the knowledge on foundations of accounting and accounting cycle	2	70	60	M	M	L	L	M	M	L	H	M	L	L	L	-	-	-
CLO-2 :	Acquire the ability to prepare statutory financial statements	2	70	60	M	H	L	M	H	L	L	H	H	L	L	M	-	-	-
CLO-3 :	Apply the tools and techniques to analyze and interpret financial statements	2	70	80	M	H	L	M	H	L	L	H	M	L	M	M	-	-	-
CLO-4 :	Appreciate the concepts of Cost accounting systems	2	70	75	M	M	L	M	M	L	L	M	H	L	M	L	-	-	-
CLO-5 :	Apply the techniques of marginal costing and budgetary control	2	80	85	M	H	L	H	M	M	L	H	M	L	H	M	-	-	-
CLO-6 :	Interpret the corporate annual reports	2	80	85	M	H	L	M	M	M	L	H	M	L	M	M	-	-	-

Duration (hour)		6	6	6	6	6
S-1	SLO-1	Accounting concept : *Introduction*	*Financial Statements: Form and Contents of Financial Statements*	*Cash Flow and Fund Flow Techniques*	*Costing Systems – meaning of cost;* Types of costs	*Company Accounts – meaning and features*
	SLO-2	*Concepts and Conventions*	*Final Accounts; Preparing Trading Account* - **Simple Problems**	*Introduction;* **Cash Flow Analysis – meaning, uses; Format of Cash Flow Statement (CFS)**	*Elements of Cost – Material, Labour and Overheads*	*Annual Reports – meaning and purpose*
S-2	SLO-1	*Financial Statements- Understanding*	*Preparing Profit & Loss Account*	Preparation of Cash Flow Statement	Cost sheet – simple problem	*Audit Reports – purpose and contents*
	SLO-2	*Interpreting Financial Statements*	Simple Problems	Simple Problems in CFS	*Cost Behavior and Cost Allocation; Overhead Allocation (only theory)*	*Statutory Requirements*
S-3	SLO-1	*Accounting Process – steps in accounting cycle - Book Keeping and Record Maintenance;*	*Preparing Balance Sheet*	Additional Problems in CFS	*Unit Costing, Process Costing – meaning, application (only theory)*	*Directors' Report – purpose and* contents
	SLO-2	*Fundamental Principles of Accounting*	Simple Problems		*Job Costing – meaning, application ; Absorption Costing – meaning, application (only theory)*	
S-4	SLO-1	*Double Entry System; Journal book;* Entering transactions in Journal (sample problem)	*Analyzing and Interpreting Financial Statements* - Techniques	Funds Flow Analysis – meaning, uses; Format of Funds Flow Statement (FFS)	*Marginal Costing - Cost Volume Profit (CVP) Analysis – uses, application; CVP chart*	*Notes to Accounts – purpose and contents*

Duration (hour)		6	6	6	6	6
	SLO-2	*Ledger book;* Posting into ledger (sample problem)	Ratio Analysis – types of ratios	Preparation of Funds Flow Statement	*Simple problems in CVP analysis; ABC Analysis*	
S-5	SLO-1	*Cash Book; Subsidiary Books (only theory)*	Calculation of ratios	Simple Problems	*Budgets – meaning, uses*	*Pitfalls in Accounting and Reporting*
	SLO-2	*Trial Balance*	Simple problems in ratio analysis		Sample problems in cash and flexible budgets only	
S-6	SLO-1	*Preparing trial balance (sample problem)*	*Accounting Standards*	*Difference between Cash flow statement and Funds flow statement*	*Class Discussion: Application of costing concepts in the Service Sector*	*Case Discussion: Recent Annual Report of Infosys can be discussed.*
	SLO-2	*Rectification of Errors; Errors disclosed and not disclosed by trial balance (only theory)*	*Class Discussion: Corporate Accounting Fraud - A Case Study of Satyam*			
	SLO-2					

Learning Resources	
1. *Robert N Anthony, David Hawkins, Kenneth Merchant, Accounting: Texts and Cases, McGraw-Hill, 13th Edition, 2017*	4. *S.P. Jain and K.L. Narang, Cost Accounting: Principles and Practice, Paperback, Kalyani Publishers, 2014*
2. Dr. Narayana Swamy, Financial Accounting for Managers, Tata McGraw Hill, 2018 edition	5. *Case Study Materials: To be distributed for class discussion*
3. Gerald I. White, Ashwinpaul C. Sondhi, Dov Fried, The Analysis and use of financial statements – N.J. Wiley, 3rd edition, 2003	6. *Equity research reports published by Citi group, Barkley's and HSBC on fundamental analysis; Also book titled "Balance sheet reading" by Dun and Brad street and YouTube videos on how to read a Balance Sheet*

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*40 %*	-	*30 %*	-	*30 %*	-	*30 %*	-	*30%*	-
	Understand										
Level 2	Apply	*40 %*	-	*40 %*	-	*40 %*	-	*40 %*	-	*40%*	-
	Analyze										
Level 3	Evaluate	*20 %*	-	*30 %*	-	*30 %*	-	*30 %*	-	*30%*	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conference Paper, etc.

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert Member from TCS	**-**	*Dr. Kavitha Shanmugam, SRMIST* *Dr. K.T. Vijay Karthigeyan, SRMIST*

Course Code	18CSC365J	Course Name	ARTIFICIAL INTELLIGENCE	Course Category	C	Professional Core	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Engineering	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	Provide a broad understanding of the basic techniques for building intelligent computer systems and an understanding of how AI is applied to problems.			
CLR-2 :	Gain knowledge in problem formulation and building intelligent agents			
CLR-3 :	Plan the search technique procedures applied to real world problems			
CLR-4 :	Discuss the types of logic and knowledge representation schemes			
CLR-5 :	Acquire knowledge in planning and learning algorithms			
CLR-6 :	Gain knowledge in AI Applications and advances in Artificial Intelligence			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Program Learning Outcomes (PLO)														
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
					Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Formulate a problem and build intelligent agents	1	80	70	M	M	M	M	H	-	-	-	M	L	-	H	L	L	L
CLO-2 :	Apply appropriate searching techniques to solve a real-world problem	2	85	75	M	H	H	H	H	-	-	-	M	L	-	H	M	L	M
CLO-3 :	Analyze the problem and infer new knowledge using suitable knowledge representation schemes	2	75	70	M	H	H	M	H	-	-	-	M	L	-	H	M	L	M
CLO-4 :	Develop planning algorithms on real world problems	2	85	80	M	H	M	H	H	-	-	-	M	L	-	H	M	M	M
CLO-5 :	Design an expert system	3	85	75	M	H	H	H	H	-	-	-	M	L	-	H	H	M	H
CLO-6 :	Implement advance techniques in Artificial Intelligence	3	80	70	L	H	M	M	H	-	-	-	H	L	-	H	H	M	H

Duration (hour)		15	15	15	15	15
S-1	SLO-1	Introduction, Overview of AI-	Search techniques – uniform search strategies	- Adversarial search	Procedural versus Declarative knowledge	Planning – Planning graphs
	SLO-2	Problems of AI	Breadth first search	Game playing	Logic programming	Non-linear planning
S-2	SLO-1	AI technique	Depth first search	Optimal decisions and strategies in games	Forward reasoning	Reactive planning
	SLO-2	Tic – Tac – Toe problem	Depth limited search	Minimax search procedure	Backward reasoning	Partial Order Planning
S-3	SLO-1	Defining the problem as state space search	Bidirectional search	Alpha-beta pruning	Matching	STRIPS planner
	SLO-2	Production system	Comparing uniform search strategies	Additional refinements, iterative deepening	Control knowledge	Planning as a state-space search
S 4-5	SLO-1	Lab 1: Implementation of 8-puzzle problem	Lab4 : Implementation and analysis of DFS and BFS for an application	Lab 7 : Implementation of minimax algorithm for an application	Lab10: Implementation of knowledge representation schemes – use cases	Lab 13: Implementation of real-world problem using STRIPS planner
	SLO-2					
S-6	SLO-1	Problem characteristics	Heuristic search strategies – Greedy best first search	Knowledge and reasoning	Representing knowledge in an uncertain domain	Planning - Knowledge-based planning
	SLO-2	Issues in the design of search programs	A* search, AO* search	Knowledge representation issues	The semantics of Bayesian networks	Syntactic Temporal logic
S-7	SLO-1	Performance measuring	Memory bounded heuristic	Representation and mapping	Dempster-Shafer theory	Execution monitoring and Re-planning

Duration (hour)		15	15	15	15	15
	SLO-2	*Problem space and search*	*Local search algorithms and Optimization problems: Hill climbing search*	*Approaches to knowledge representation*	*Fuzzy logic*	*Continuous planning*
S-8	SLO-1	*Real-world problems*	*Simulated annealing search*	*Using propositional logic*	*Forward and backward reasoning*	*Multi-agent planning*
	SLO-2	*Problem reduction methods*	*Local beam search*	*Representing a simple fact in logic*	*Probabilistic reasoning over time*	*Job-scheduling problem*
S 9-10	SLO-1	*Lab 2: Implementation of toy problems*	*Lab 5: Developing Best first search and A* Algorithm for real world problems*	*Lab 8: Implementation of propositional logic in real world problems*	*Lab 11: Implementation of uncertain methods for an application*	*Lab 14: Implementation of Job scheduling problem*
	SLO-2					
S-11	SLO-1	*Intelligent agents*	*Constraint satisfaction problems (CSP)*	*Representing instant and ISA relationship*	*Planning – Planning problems, Simple planning agent*	*Expert system architecture*
	SLO-2	*Agents and environment*	*Crypto arithmetic puzzles*	*Computable functions and predicates*	*Planning languages*	*Pros and cons of expert system*
S-12	SLO-1	*Nature of environment*	*CSP as a search problem – constraints and representation*	*Unification and Resolution*	*Blocks world, Goal stack planning*	*Representation domain knowledge*
	SLO-2	*Structure of agents*	*CSP-Backtracking, Role of heuristic*	*Natural deduction*	*Hierarchical planning*	*Using domain knowledge*
S-13	SLO-1	*Goal based agents, Utility based agents*	*CSP – Forward checking and constraint propagation*	*Representing knowledge using rules*	*Means Ends analysis*	*Expert system shells*
	SLO-2	*Learning agents*	*CSP – Intelligent backtracking*	*Logic programming*	*Conditional planning*	*Knowledge acquisition*
S 14-15	SLO-1	*Lab 3: Developing agent programs for real world problems*	*Lab 6: Implementation of constraint satisfaction problems*	*Lab9: Implementation of unification and resolution for real-world problems*	*Lab 12: Implementation of block world problem*	*Lab 15 Case study and Implementation of simple expert system*
	SLO-2					

Learning Resources	1. *Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach* 2. *Artificial Intelligence, Russel, Pearson* 3. *Artificial Intelligence, Ritch & Knight, TMH* 4. *Introduction to Artificial Intelligence & Expert Systems, Patterson, PHI*	5. *Logic &Prolog Programming, Saroj Kaushik, New Age International* 6. *Expert Systems, Giarranto, VIKAS*

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*20%*	*20%*	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Understand										
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze										
Level 3	Evaluate	*10%*	*10%*	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Create										
	Total	100 %		100 %		100 %		100 %		100%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert Member from TCS	-	*Dr .P.C. Karthiik, SRMIST*

Course Code	18CSC364J	Course Name	INFORMATION SECURITY	Course Category	C	Professional Core	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Engineering	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	Analyse different security parameter techniques			
CLR-2 :	Write various access security for control models			
CLR-3 :	Plan logic-based system policies secure information			
CLR-4 :	Organise the applications of operating systems secure information			
CLR-5 :	Imlement network security tools and vulnerability assessment tools			
CLR-6 :	Analyse the different auditing techniques for security			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Develop code for security parameters Techniques to solve the problems	3	80	70	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-
CLO-2 :	Build control models to access security.	3	85	75	M	H	L	M	L	-	-	-	M	L	-	H	-	-	-
CLO-3 :	Construct code for logic-based application.	3	75	70	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-4 :	Develop a signature scheme using Operating Systems	3	85	80	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-5 :	Demonstrate the network security system using open-source tools	3	85	75	H	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-6 :	Construct the different auditing techniques	3	80	70	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-

Duration (hour)		15	15	15	15	15
S-1	SLO-1	Confidentiality	Confidentiality Policies	Malicious Systems	Security Architecture	Security Requirements, Threats, and Concepts
	SLO-2	Integrity	Integrity Policies	Vulnerability analysis	Security Architecture - Implemetation	Security Policies and Tips
S-2	SLO-1	Availability	Hybrid Policies	Auditing of Logic based system	Linux Commands	Authentication Methods
	SLO-2	Security Violation	Non-Interface Composition	Intrusion Detection	Linux Commands Analysis	Authorization: Privileges, Roles, Profiles, and Resource Limitations
S-3	SLO-1	Security Threats	Policy Composition	Intrusion Detection - Implementation	Linux commands Security	Access Control on Tables, Views, Synonyms, or Rows
	SLO-2	Security Policy and Procedure	International Standards	Intrusion Detection – Logic	Linux Commands Security Implementation	Security Checklists and Recommendations
S 4-5	SLO-1	Lab 1: Implementation of Overview of Security	Lab 4: Implementation of Security Policies	Lab 7: Implementation of Logic-based System	Lab 10: Implementation of Applications of Operating Security	Lab 13: Introduction to Database Security
	SLO-2					
S-6	SLO-1	Assumptions and Trust	Design Principles	Network Security	Database Security Architecture	Auditing Types and Records
	SLO-2	Security Assurance	Representing Identity	Operating System Security	Database Security Architecture - Implementation	Statement Auditing
S-7	SLO-1	Implementation Issues	Control of Access flow	User Security	Database Security Types	Privilege Auditing
	SLO-2	Operational Issues	Information Flow	Program security	Application of Database Security	Schema Object Auditing

Duration (hour)		15	15	15	15	15
S-8	SLO-1	*Security Life Cycle*	*Confinement Problem*	*Program Security Implementation*	*Key pillars of Database Security*	*Fine grained Auditing*
	SLO-2	*Discretionary and Mandatory Models*	*Confinement Problem - Implementation*	*Program Security Application Analysis*	*Implementation of Database security*	*Focus object Auditing*
S 9-10	SLO-1	*Lab 2: Implementation of Security Parameters*	*Lab 5 :Implementation of Systems Design*	*Lab 8 :Implementation of Logic based Application*	*Lab11: Implementation of Database Security*	*Lab 14:Implementation of Database Auditing*
	SLO-2					
S-11	SLO-1	*Roll-based model*	*Formal Methods*	*Data Privacy*	*Establish Strong Identity Controls*	*DML Actions*
	SLO-2	*Task-based model*	*Formal Methods Implementation*	*Implementation of Data Privacy*	*Access Management Control*	*Creating Policies*
S-12	SLO-1	*Unified Models*	*Evaluating Systems*	*Digital Forensics*	*Disaster Recovery*	*Security Privacy Auditing*
	SLO-2	*Access Control Algebra*	*Evaluation System design*	*Digital Forensics Implementation*	*Risk Mitigation Plan*	*Secure External Password Store*
S-13	SLO-1	*Temporal model*	*Evaluation System Implementation*	*Enterprise Security Specification*	*Cyber security Measure*	*Administering Authentication*
	SLO-2	*Spatio-temporal Model*	*Evaluating System Assurance*	*Enterprise Security Specification - Applications*	*Anomalous Data Traffic*	*Configure grained Auditing*
S 14-15	SLO-1	*Lab 3: Implementation of Access Control Models*	*Lab 6:Building Systems with Assurance*	*Lab 9: Implementation of Logic Based system Special Topics*	*Lab 12: Implementation of Enterprise Security*	*Lab 15: Implementation of Fine grained Auditing*
	SLO-2					

Learning Resources

1. *Security Engineering*,Ross Anderson
2. *Computer Security: Art and Science*,M. Bishop, Pearson Education.
3. *Information Security: Principles and Practice*, M. Stamp.
4. *Security in Computing, C.P. Pfleeger, S.L. Pfleeger, J. Margulies.*
5. *Secure Programming HOWTO, David Wheeler.*
6. *Browser Security Handbook, Michael Zalewski.*
7. *Handbook of Database Security, M. Gertz, S. Jajodia.*

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Understand										
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze										
Level 3	Evaluate	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Create										
	Total	100 %		100 %		100 %		100 %		100%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert Member from TCS	-	*Dr. R. Naresh, SRMIST*

Course Code	18CSC363J	Course Name	COMPUTER NETWORKS	Course Category	C	Professional Core	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Business Systems	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	Describe protocol layering and physical level communication			
CLR-2 :	Analyze the performance of a network.			
CLR-3 :	Understand the various components required to build different networks.			
CLR-4 :	Learn the functions of network layer and the various routing protocols.			
CLR-5 :	Familiarize the functions and protocols of the Transport layer.			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	Explain the basic layers and its functions in computer networks.	3	80	70
CLO-2 :	Evaluate the performance of a network based on error detection and correction mechanisms.	3	85	75
CLO-3 :	Understand the basics of how data flows from one node to another.	3	75	70
CLO-4 :	Design various routing algorithms along with the network addressing	3	85	80
CLO-5 :	Design protocols for various functions in the network.	3	85	75
CLO-6 :	Explain the working of various application layer protocols.	3	80	70

Program Learning Outcomes (PLO)														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
H	H	-	-	-	-	-	-	L	H	-	H	-	-	-
M	H	L	M	L	-	-	-	M	L	-	H	-	-	-
M	L	-	H	L	-	-	-	M	L	-	H	-	-	-
M	M	H	H	L	-	-	-	M	L	-	H	-	-	-
H	M	M	H	L	-	-	-	M	L	-	H	-	-	-
L	H	-	H	L	-	-	-	L	L	-	H	-	-	-

Duration (hour)		15	15	15	15	15
S-1	SLO-1	Introduction- Computer networks and distributed systems	Data Link Layer and Medium Access Sub Layer: Fundamentals of Error Detection and Error Correction	Network Layer: Network Layer Services	Transport Layer: Introduction	TELNET
	SLO-2	Classifications of computer networks	Block coding	Switching	Process to Process Communication	
S-2	SLO-1	Preliminaries of layered network structures	Hamming Distance	Logical addressing	Datagram Protocol (UDP)	EMAIL
	SLO-2	Data communication Components:- Representation of data and its flow	CRC	IPV4		
S-3	SLO-1	Various Connection Topology	Flow Control and Error control protocols - Stop and Wait	IPV6 Address mapping	Transmission Control Protocol (TCP)	FTP
	SLO-2		Go-back–N ARQ			WWW
S 4-5	SLO-1	Lab 1: Learn to use commands like tcpdump, netstat, ifconfig, and nslookup.	Lab 4: Create a socket for HTTP for web page upload and download.	Lab 7 : Implementation of Sliding Window Protocol.	Lab10: Applications using TCP Sockets like a. Echo client and echo server	Lab 13: Applications using TCP and UDP Sockets like a. DNS
	SLO-2					
S-6	SLO-1	Protocols and Standards	Selective Repeat ARQ	ARP	SCTP Congestion Control	SNMP
	SLO-2	OSI model	Sliding Window			
S-7	SLO-1	OSI model	Sliding Window	RARP	Quality of Service (QoS)	HTTP
	SLO-2	Transmission Media	Piggy backing	BOOTP	QoS improving techniques	Bluetooth

Duration (hour)		15	15	15	15	15
S-8	*SLO-1*	*Transmission Media*	*Random Access*	*DHCP, Delivery*	*Leaky Bucket algorithms*	*Firewalls*
	SLO-2	*LAN: Wired LAN*	*Multiple access protocols*			
S 9-10	*SLO-1*	*Lab 2: Write a Program simulating PING and TRACEROUTE commands*	*Lab 5: Simulation of error correction code (like CRC).*	*Lab 8: Implementation of ARP protocol.*	*Lab 11: Applications using TCP Sockets like a. Chat b. File Transfer*	*Lab 14: Applications using TCP and UDP Sockets like a. SNMP*
	SLO-2					
S-11	*SLO-1*	*Wireless LAN*	*Pure ALOHA*	*ICMP*	*Token Bucket algorithms*	*Network Security: Introduction*
	SLO-2	*Virtual LAN*	*Slotted ALOHA*			*Electronic mail*
S-12	*SLO-1*	*Techniques for Bandwidth utilization:- Multiplexing*	*CSMA/CD*	*Forwarding and Unicast Routing protocols*	*Application Layer: DNS*	*Directory services*
	SLO-2	*Frequency division*				*Network management*
S-13	*SLO-1*	*Time division and Wave division*	*CDMA/CA*	*IPV6 Protocol*	*DDNS*	*Basic concepts of Cryptography*
	SLO-2	*Concepts on spread spectrum*				
S 14-15	*SLO-1*	*Lab 3: Implement a Socket Programming for Client – Server model*	*Lab 6: Implementation of Stop and Wait Protocol*	*Lab9: Implementation of RARP protocol.*	*Lab 12: Simulation of DNS using UDP sockets*	*Lab 15 : Applications using TCP and UDP Sockets like a.File Transfer*
	SLO-2					

Learning Resources	
1. William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013 *2.* Andrew S. Tanenbaum and David J. Wetherall, Computer Networks, 5th Edition,2014. *3.* Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.	*4.* Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition TMH, 2013 *5.* James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Sixth Edition, Pearson Education, 2013. *6.* Network Security: Private Communication in a Public World, C. Kaufman, R. Perlman and M. Speciner, Second Edition, Prentice Hall .2002.

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Understand										
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze										
Level 3	Evaluate	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Create										
	Total	100 %		100 %		100 %		100 %		100%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert Member from TCS	-	*Dr. M. Baskar , SRMIST*

Course Code	18LEM110L	Course Name	INDIAN ART FORM	Course Category	M	*Mandatory*	L	T	P	C
							0	0	2	0

Pre-requisite Courses	*Nil*	Co-requisite Courses	*Nil*	Progressive Courses	*Nil*
Course Offering Department	*English and Foreign Languages*	Data Book / Codes/Standards	*Nil*		

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*	Learning		
		1	2	3
CLR-1 :	*Introduce the learners to the changing art forms in different periods of time: richness, variety and significance of various Indian art forms*			
CLR-2 :	*Enable the students to recognize and appreciate paintings of different schools prevalent in the different geographical locations*			
CLR-3 :	*Draw the learner's attention towards the various types of sculpture based on the materials used and the themes behind them*			
CLR-4 :	*Cultivate a sense of appreciation about the aesthetics of drawing as an integral part of our daily life*			
CLR-5 :	*Orient the learners about the changing Indian social scenario and the ways they are reflected in the changing facets of Modern Indian Art Forms*			

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	*equip with an awareness of the rich cultural heritage of India*	*3*	*90*	*85*
CLO-2 :	*understand the contexts and significance of various Indian art forms*	*3*	*90*	*85*
CLO-3 :	*understand how the confluence of the diverse art forms of India create the mosaic of the Indian nation*	*3*	*90*	*85*

Program Learning Outcomes (PLO)														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
-	-	-	-	-	*H*	*M*	*H*	*H*	*H*	-	*H*	-	-	-
-	-	-	-	-	*H*	*M*	*M*	*H*	*H*	-	*H*	-	-	-
-	-	-	-	-	*H*	*M*	*H*	*H*	*H*	-	*H*	-	-	-

Duration (hour)		Indian Art over Ages - An Overview	Indian painting	Indian sculpture	The Indian Art of Floor Decoration	Modern Art
S-1	SLO-1	Ancient India: An Overview	Indus Valley civilization paintings on pottery	Sculpture during the Harappan period	*Kolam - the traditional floor drawing of South India*	*Nationalist School of Bengal Art- Introduction*
	SLO-2	Raj-Ravi Verma: religious stories like mythologies of Hindu gods	Cave paintings from different parts of India	Terra Cota – What? Where? When? – A discussion	Daily life and Kolam - Line drawings, geometric designs and natural world - Some examples	*Matching the picture with the artist*
S-2	SLO-1	*Mysore and Tanjore Art : included themes revolving around Hindu epics like Ramayana and Mahabharata*	*The paintings of the Ajanta and Ellora caves*	*Rock cut sculpture – Differences between rock cut sculpture and stone sculpture*	*Beliefs behind Kolam*	*Tracing the major ideas through paintings – Going back to Hindu themes*
	SLO-2	Indian artists from different fields	Paintings of North India, South India, East India, West India, Central and Deccan India	Sculptures in religious buildings	Rangoli – Occasions and motifs	Student presentations on individual artists
S-3	SLO-1	Folk Art	*Thanjavur, Madhubani paintings*	*Buddhism, Hinduism, and Jainism in sculpures*	Kalamezhuthu in Kerala - Religious significance	*Tracing the major ideas through paintings – Indian Village Life and nationalist themes*
	SLO-2	Folk art and popular culture: classical and folk art	*Analysing the recurrent themes style through selected illustrations*	Visit to Mahabalipuram and submitting a report by the students	Mandana paintings of Rajasthan and Madhya Pradesh by oldest tribal communities	Student presentations on individual artists

Duration (hour)		Indian Art over Ages - An Overview	Indian painting	Indian sculpture	The Indian Art of Floor Decoration	Modern Art
S-4	SLO-1	Influential factors giving rise to modern art	Kalamkari paintings – Features of organic art; obtaining colours from natural sources	*Bronze sculptures in India*	Bengal's floor art-Alpona	*European influences (British) – Trends in painting – portrait, landscape and realistic*
	SLO-2	Concepts and Motifs behind modern art	*Attempting simple Kalamkari/Madhubani paintings using natural colours*	Cultural stonework in India - in the form of primitive cupule art	*Festival specific Floor Art across India*	Collection and display of paintings by various artists
S-5	SLO-1	Mughal paintings	Pattachitra paintings	*the Buddhist Pillars of Ashoka of the Mauryan period*	Festival specific Floor Art across India	*British Gothic and Indo Saracenic architecture through examples*
	SLO-2	Astonishing contemporary paintings by Indian artists	Students presenting and sharing their paintings	The figurative Greco-Buddhist sculpture of the Gandhara and Mathura schools, and the Hindu art of the Gupta period: Brief Introduction	Pookalam: The Onam Floral Rangoli	Field trip to places in Chennai which have Indo Saracenic architecture and report submission
S-6	SLO-1	*Fairs, festivals and local deities in the development of art forms*	*Moghal paintings*	*Khajuraho Temples in Madhya Pradesh*	Body Art: Traditional Mehendi	*Indian Art post-Independence Progressive Artists' Group and their Influence*
	SLO-2	myth, legends, snippets from epic, multitudinous gods born out of dream and fantasy in art forms	Moghal paintings from the various Moghal dynasties and identification of the common features	Debate on "Religion and Art Today"	Mehendi designs, religious and cultural significances	Fusion of western style and Indian themes

Learning Resources	1. *Ketkar, Anil Rao Sandhya. The History of Indian Art (Paperback). Jyotsna Prakashan, 2017.* 2. *Chaturvedi, P. N. Encyclopedia of Indian Art and Architecture. M. D. Publications Pvt. Ltd., 2009.*	3. *Gupta, S. P. Elements of Indian Art:Including Temple Architecture, Iconography and Iconometry. D. K. World Ltd., 2006* 4. *Goswamy, B. N. Ed. Oxford Readings in Indian Art. OUP, 2018.* 5. *https://courses.lumenlearning.com/boundless-arthistory/chapter/contemporary-indian-art/*

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (100% weightage)								Final Examination	
		CLA – 1 (20%)		CLA – 2 (30%)		CLA – 3 (30%)		CLA – 4 (20%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	-	*40%*	-	*30%*	-	*30%*	-	*30%*	-	-
	Understand										
Level 2	Apply	-	*40%*	-	*40%*	-	*40%*	-	*40%*	-	-
	Analyze										
Level 3	Evaluate	-	*20%*	-	*30%*	-	*30%*	-	*30%*	-	-
	Create										
	Total	100 %		100 %		100 %		100 %		-	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts

SEMESTER - VII

Course Code	18MBH463J	Course Name	SERVICES SCIENCE AND SERVICE OPERATIONAL MANAGEMENT	Course Category	C	Humanities & Social Sciences	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	College of Management	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	Define the differences between goods and services			
CLR-2 :	Discuss characteristics of services			
CLR-3 :	Analyse services design concepts and evaluate them			
CLR-4 :	Discuss methods to manage Service business			
CLR-5 :	Plan innovation in Service			
CLR-6 :	Incorporate the different types of services and management strategy			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Analyse concepts about Services and distinguish it from Goods	3	80	70	M	M	M	M	M	M	-	-	M	M	L	M	-	-	-
CLO-2 :	Identify characteristics and nature of Services	3	85	75	M	H	L	M	L	-	-	-	M	L	-	H	-	-	-
CLO-3 :	Comprehend ways to design Services and evaluate them using Service qualities	3	75	70	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-4 :	Apply how various methods can be used to operate and manage Service businesses	3	85	80	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-5 :	Explain how innovation can be approached from Services point of view	3	85	75	H	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-6 :	Construct the different types of services and management strategy for them	3	80	70	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-

Duration (hour)		15	15	15	15	15
S-1	SLO-1	Introduction-Basic Terminology	Strategic Service Vision	Technology in Service	Capacity Planning	Management of Service Project
	SLO-2	Service Economy	Competitive environment for Services	Emergence of Service Encounter	Leveling Capacity	Service Product Development
S-2	SLO-1	Role of Services	Competitive Service Strategies	Service Encounter Triad	Demand Management	Project Management
	SLO-2	Evolution of Economy	Strategic Analysis	Encounter Dominated by the Service Organization	Demand Management Strategies	Principles of Project Management
S-3	SLO-1	Nature of Service Sector	Service Benchmarking	Contact Personnel–Dominated Encounter	Customer-Induced Variability	Project Management Process
	SLO-2	Differences between Goods and Services	Service Innovation	Customer-Dominated Encounter	Segmenting Demand	Triple Objectives
S 4-5	SLO-1	Experience Economy	New Service Development.	Service Organization Elements	Offering Price Incentives/ Promoting Off-Peak Demand	Project Team/ Project Leadership
	SLO-2	Service Dominant Logic				
S-6	SLO-1	Characteristics of Service Operations	Service System Design	Service Control Systems	Developing Complementary Services	Project Management Techniques
	SLO-2	Complexity – Customer Participation	Approaches for Service Design	Contact Personnel management	Reservation Systems and Overbooking	Objectives of Project Management
S-7	SLO-1	Simultaneity and its consequences	Service Quality	Customer Expectations	Strategies for Managing Capacity	Gantt Charts
	SLO-2	Perishability	SERVQUAL	Creating Customer Orientation	Defining Service Capacity	Pros and Cons of Gantt charts
S-8	SLO-1	Intangibility	Walk Through Audits	Service Profit chain	Daily Workshift Scheduling	Project network

Duration (hour)		15	15	15	15	15
	SLO-2	*Heterogeneity*	*Quality by Design*	*Facility Design*	*Daily Workshift with constraints*	*Critical Path Method*
S 9-10	SLO-1	*Non Transference of Ownership*	*Strategic Positioning*	*Process Analysis*	*Increasing Customer Participation*	*Resource Constraints*
	SLO-2	*Outcomes of complexity*				
S-11	SLO-1	*Pre-industrial Economy*	*Service Blueprint*	*Facility layout*	*Creating Adjustable Capacity*	*Activity Crashing*
	SLO-2	*Industrial Economy*	*Taxonomy of Service Process*	*Environment Orientation*	*Sharing Capacity*	*Activity Crashing tools*
S-12	SLO-1	*Post-Industrial Economy*	*Degree of Divergence*	*Process Improvement*	*Yield Management*	*Uncertainty in Activity duration*
	SLO-2	*Evolution and Innovation*	*Object of Service Process*	*Queue analysis*	*Productivity/ Part time Employees*	*PERT*
S-13	SLO-1	*Value co-creation*	*Customer Contact types*	*Queue Applications*	*Waiting Line Management*	*Issues in CPM*
	SLO-2	*Service Encounters*	*Information Empowerment*	*Service Productivity*	*Service Level*	*Issues in PERT*
S 14-15	SLO-1	*Service Package*	*Customer Centric approaches*	*Quality Tools*	*Demand Forecasting*	*Project Monitoring techniques*
	SLO-2	*Grouping by Delivery Processes*				

Learning Resources	1. *Fitzsimmons & Fitzsimmons, Service Management: Operations, Strategy, Information Technology, McGraw Hill publications (9th edition), 2019* 2. *Wilson, A., Zeithaml, V. A., Bitner, M. J., & Gremler, D. D. (2012). Services marketing: Integrating customer focus across the firm. McGraw Hill.* 3. *Lovelock, C. (2011). Services Marketing, 7/e. Pearson Education India*	4. *Reason, Ben, and Lovlie, Lavrans, (2016) Service Design for Business: A Practical Guide to Optimizing the Customer Experience, Pan Macmillan India* 5. *Chesbrough, H. (2010). Open services innovation: Rethinking your business to grow and compete in a new era. John Wiley & Sons*

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Understand										
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze										
Level 3	Evaluate	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Create										
	Total	100 %		100 %		100 %		100 %		100%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert Member from TCS	-	*Dr. S.K. Manivannan, SRMIST* *Dr.K.Sadasivan, SRMIST*

Course Code	18MBH464J	Course Name	IT PROJECT MANAGEMENT	Course Category	C	Professional Core	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Business Systems	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	Familiarize the software life cycle methods and overview of software project.
CLR-2 :	Understand the various techniques for requirements, planning ,managing and estimation of a technology project
CLR-3 :	Examine the project management features.
CLR-4 :	Understand the Agile methodologies
CLR-5 :	Understand the SCRUM methodologies

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	Identify the process of project life cycle model and process	2	80	70
CLO-2 :	Analyze and specify software requirements through a productive working Relationship with project stakeholders	2	85	75
CLO-3 :	Design the system based on Agile process model	2	75	70
CLO-4 :	Develop the product using SCRUM model.	3	85	80

Program Learning Outcomes (PLO)	1 Engineering Knowledge	2 Problem Analysis	3 Design & Development	4 Analysis, Design, Research	5 Modern Tool Usage	6 Society & Culture	7 Environment & Sustainability	8 Ethics	9 Individual & Team Work	10 Communication	11 Project Mgt. & Finance	12 Life Long Learning	13 PSO - 1	14 PSO - 2	15 PSO – 3
CLO-1 :	M	-	-	-	M	-	L	-	-	-	-		-	-	-
CLO-2 :	-	H	-	-	M	-	-	L	-	-	-	-	-	-	-
CLO-3 :	H	-	M	-	-	-	-	-	-	-	-	M	-	-	-
CLO-4 :	-	-	M	H	-	-	-	-	-	-	-	-	-	-	-

Duration (hour)		15	15	15	15	15
S-1	SLO-1	Introduction to Software Engineering	Project Scheduling	Project Risk Analysis	Introduction to Agile process development	Scrum Methodology, its terminologies
	SLO-2	Software management life cycle	Defining a Task set	Project Risk Analysis	Introduction to Agile process development	Scrum Methodology, its terminologies
S-2	SLO-1	Project Identification	Defining network set	Project Risk management	Manifesto of Agile process	Framework and its scope
	SLO-2	Software process Models	Defining network set			
S-3	SLO-1	Traditional Models, Conventional models	Introduction to Programme Evaluation review Techniques (PERT) and Critical Path method (CPM)	RMMM plan and control	Agile Principles	Project management activities- sprint backlog, sprint review,
	SLO-2					
S 4-5	SLO-1	Lab 1: Requirement Gathering and analysis	Lab 4:Project Evaluation and Review Technique (PERT) analysis	Lab 7:- Risk Management and Mitigation	Lab10: Agile Approaches - Framework - Sprint Planning, Review	Lab13: Weekly cycle, Pair programming, Coding Standards,
	SLO-2					
S-6	SLO-1	Requirement Analysis	Critical path method calculations Scheduling -Precedence Relationship	Configuration Management Tools : Risk analysis Tools	Agile practices	Retro perspective, Best practices of Scrum ,Roles in Scrum,
	SLO-2					
S-7	SLO-1	Requirement Engineering	Key feature of PERT	Other project Management features discussion	Agile methodologies	Slack, Ten minute build, Continuous Integration.,
	SLO-2	Requirement Engineering	Key feature of PERT	Other project Management features discussion	Agile methodologies	Slack, Ten minute build, Continuous Integration.,
S-8	SLO-1	Requirement elicitation	Characteristics of CPM	Project audits: Objectives and goals, Types of audits	Agile Framework	Introduction to DevOps
	SLO-2	Requirement elicitation	Characteristics of CPM	Project audits: Objectives and goals, Types of audits	Agile Framework	Introduction to DevOps
S	SLO-1	Lab 2: Identification of process	Lab 5: Critical Path Method (CPM)		Lab 11: Daily Scrum Planning,	Lab 14: DevOps using Docker

9-10	SLO-2	*methodology and stake holder description.*	*analysis*	*Lab 8: RMMM Plan Configuration Management, Software Configuration Management - GitHub*	*Story Boards Creation, Tracking Progress, Sprint Review.*	
S-11	SLO-1	*Market and Demand Analysis*	*Comparison of network based project management techniques, PERT and CPM*	*Project Termination*	*Phases of development*	*Introduction to XP*
	SLO-2	*Market and Demand Analysis*	*Comparison of network based project management techniques, PERT and CPM*	*Project Termination*	*Phases of development*	*Introduction to XP*
S-12	SLO-1	*Software project effort*	*Float Calculation and its importance*	*Software Testing, testing strategies*	*Relationship between Conventional Agile,*	*Process methodology*
	SLO-2	*Software project effort*	*Float Calculation and its importance*	*Software Testing, testing strategies*	*Relationship between Conventional Agile,*	*Process methodology*
S-13	SLO-1	*Project cost estimation*	*Project Cost Control (PERT/Cost)*	*Types of Testing, Evaluation of project*	*IT Service Management-Lifecycle*	*Framework and its limitations*
	SLO-2	*Financial Appraisal*	*Project Cost Control (PERT/Cost)*	*Types of Testing, Evaluation of project*	*IT Service Management-Lifecycle*	*Framework and its limitations*
S 14-15	SLO-1	*Lab 3: Market demand analysis and demand planning*	*Lab 6: Software Cost Estimation models using various techniques*	*Lab 9:Unit testing with test cases*	*Lab 12: Agile Approaches - Extreme Programming - Small releases Scrum, Lean ,*	*Lab 15: XP Programming*
	SLO-2					

Learning Resources	1. *Roger S. Pressman, Software Engineering – A Practitioner Approach, 11th ed., McGraw Hill, 2015* 2. *Ian Sommerville, Software Engineering, 10th ed., Pearson Education, 2010* 3. *Rajib Mall, Fundamentals of Software Engineering, 4th ed., PHI Learning Private Limited, 2014*	4. *Roman Pichler, Agile Product Management with Scrum* 5. *Ken Schwaber, Agile Project Management with Scrum (Microsoft Professional)* 6. *Jim Smith Agile Project Management: Creating Innovative Products,Pearson 2008.* 7. *Mike Cohn, Succeeding with Agile: Software Development Using Scrum*

Learning Assessment

	Bloom's Level of Thinking	*Continuous Learning Assessment (50% weightage)*								*Final Examination (50% weightage)*	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	*Remember* / *Understand*	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
Level 2	*Apply* / *Analyze*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
Level 3	*Evaluate* / *Create*	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Total	*100 %*		*100 %*		*100 %*		*100 %*		*100 %*	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert Member from TCS	-	*Dr. K. Nimala, SRMIST*

Course Code	18CSC461J	Course Name	Usability Design of Software Applications	Course Category	C	Professional Core	L	T	P	C
							2	0	2	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Business Systems	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	Familiarize the software life cycle methods and overview of software project.			
CLR-2 :	Understand the various techniques for requirements, planning ,managing and estimation of a technology project			
CLR-3 :	Examine the project management features.			
CLR-4 :	Understand the Agile methodologies			
CLR-5 :	Understand the SCRUM methodologies			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3
CLO-1 :	Restate the concepts Knowledge of quantitative engineering principles for how to build software interfaces that are usable.	1	85	80
CLO-2 :	Develop skills of Software Application Understanding that usability is more important than efficiency for almost all modern software projects	2	85	75
CLO-3 :	Primary factor that leads to product success	2	80	70
CLO-4 :	The ability to critically analyze existing user interfaces	3	80	70
CLO-5 :	Express their positive and negative aspects in engineering term	3	80	75
CLO-6 :	Confidence and competence of Software Application	3	80	70

Program Learning Outcomes (PLO)	1 Engineering Knowledge	2 Problem Analysis	3 Design & Development	4 Analysis, Design, Research	5 Modern Tool Usage	6 Society & Culture	7 Environment & Sustainability	8 Ethics	9 Individual & Team Work	10 Communication	11 Project Mgt. & Finance	12 Life Long Learning	13 PSO - 1	14 PSO - 2	15 PSO – 3
CLO-1 :	M	-	-	H	M	-	-	-	-	-	-	M	-	-	-
CLO-2 :	M	-	M	-	H	-	-	-	-	-	-	-	-	-	-
CLO-3 :	H	M	L	-	-	-	-	-	-	-	-	L	-	-	-
CLO-4 :	H	-	M	-	H	-	-	-	-	-	-	M	-	-	-
CLO-5 :	H	-	M	-	H	-	-	-	-	-	-	M	-	-	-
CLO-6 :	L	-	-	H	H	-	-	-	H	-	-	H	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Introduction to Usability Design of Software Applications	Hypertext	Navigation & Flow	GUI Excise	Usable Security
	SLO-2	Introduction and Background	Formation of the WWW	Help Users Find Your Stuff	Command Line Excise	Unusable Security Costs Security
S-2	SLO-1	Users and Usability Principles	Hypertext Engineering Design Images & Navigation	Organization in Kohl's	Techniques to Avoid Excise	Impact on Security – Long-Term
	SLO-2	Nine Golden Usability Principles, Preventing Errors, Software Seatbelts	Web-site Design Tips , Knowledge Acquisition	Web Shopping, Oddities of Web Browsing	Memory – Auto-customization, Navigation Searching	Myths of Usable Security, Cost Confusion
S 3-4	SLO-1	Lab 1: Demonstration of Design for the USER	Lab 4: Demonstration of Web-site Design	Lab 7: Demonstration of Web Browser design	Lab 10: Demonstration of GUI Excise	Lab 13: Demonstration of Myths of Usable Security
	SLO-2					
S-5	SLO-1	Highlighting and Software errors	What is a Scientific Test	UIs Must Help Users Navigate	Navigation Within Information	Pain and Consequences
	SLO-2	Examples and Discussion	Six Ways to Acquire Knowledge	Benefits of Navigation	Navigation Among Tools & Menus	Dialog Boxes & Toolbar
S-6	SLO-1	Principles, Psychopathology, and Engineering	Correlation and Causality	Flow in User Interfaces and State of Mind	Navigation Among Panes	Religious Arguments, Web Designers are Web Users
	SLO-2	Making Mistakes and Growth Mindset , Mental Models	Confusing Correlation and Causality, UI Evaluations	Design for the Probable Provide for the Possible	Undo Evolutionary design, Types of Undo	Modeless Dialog Boxes and Function Dialog Boxes

S 7-8	SLO-1 SLO-2	Lab 2: Demonstration of Growth Mindset	Lab 5: Demonstration of User Interface	Lab 8: Demonstration of Navigate design	Lab 11: Demonstration of GUI Excise	Lab 14: Demonstration of Dialog Boxes & Toolbar
S-9	SLO-1	Helping Users Choose Action	Website Design Scanning and Choosing	Making the UI Disappear, Examples and Discussion	Single vs. Multiple Undo	Mobile Usability & Courtesy
	SLO-2	Error Messages	Users Scan Web Pages	Accidental Problems Excise Tasks	Data Entry Selection	Analytical Thinking Examples and Discussion
S-10	SLO-1	People Expect Simplicity	URL Design	Essential Problems Excise Tasks	Data Integrity vs Data Immunity	Usability of Games
	SLO-2	Syntactic Signals and Application	User Success Rate , Web Site Home Pages	Philosophical Lineage Essential and Accidental Problems	Data Immunity- Flexible Rule Enforcement	Color, Effective Habits Wrapup and Review
S 11-12	SLO-1 SLO-2	Lab 3: Demonstration of User-Centered Style	Lab 6: Demonstration of URL Design	Lab 9: Demonstration of Accidental & Essential Problems Excise Tasks	Lab 12: Demonstration of Data Entry Selection	Lab 15: Demonstration of Games and Customize Controller Buttons

Learning Resources	1. *The Design of Everyday Things*, Don Norman, 1988 (reprinted 2007), Basic Books, ISBN: 0465050654. (*required*)	2. *Don't Make Me Think: A Common Sense Approach to Web Usability*, 3rd Edition, Steve Krug, 2014, New Riders Press, ISBN-10: 0321344758 (*required*)

Learning Assessment

	Bloom's Level of Thinking	*Continuous Learning Assessment (50% weightage)*								*Final Examination (50% weightage)*	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	*Remember* *Understand*	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
Level 2	*Apply* *Analyze*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
Level 3	*Evaluate* *Create*	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Total	*100 %*		*100 %*		*100 %*		*100 %*		*100 %*	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert Member from TCS	-	*Dr.R.SIVA, SRMIST*

Course Code	18CSC462J	Course Name	IT Workshop using Scilab	Course Category	C	Professional Core	L	T	P	C
							1	0	2	2

Pre-requisite Courses	NIL	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Engineering	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	Define the image fundamentals and mathematical transforms for image processing			
CLR-2 :	Provide knowledge about the image enhancement techniques and image restoration procedures			
CLR-3 :	Enable to perform image compression techniques and image segmentation procedures			
CLR-4 :	Discuss the fundamentals of color image processing			
CLR-5 :	Describe colour transformation and segmentation based on colour			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcomes (PLO)													
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Define the fundamentals of Digital image strength and weakness	3	80	70	L	L	-	-	L	-	-	-	-	L	-	H	-	-	-
CLO-2 :	Analyse various filtering and their application	3	85	75	M	H	-	-	L	-	-	-	-	L	-	H	-	-	-
CLO-3 :	Discuss image enhancement techniques in spatial domain	3	75	70	M	H	-	-	L	-	-	-	-	L	-	H	-	-	-
CLO-4 :	Explain the concepts of segmentation and boundary extraction	3	85	80	M	H	-	-	H	-	-	-	-	L	-	H	-	-	-
CLO-5 :	Obtain the computational and validation operation on an image	3	85	75	L	M	-	-	M	-	-	-	-	L	-	H	-	-	-

Duration (hour)		6	6	6	6	6
S-1	SLO-1	Introduction to SCI Lab/MATLAB- History, basic features	Controlling the hierarchy of operations or precedence	Matrix, array and basic mathematical functions	Basic plotting - Overview, creating simple plots, adding titles, axis labels, and annotations	Control flow and operators - ``if ... end'' structure, relational and logical operators, ``for ... end'' loop, ``while ... end'' loop
	SLO-2	Strengths and weaknesses	Controlling the appearance of floating point number	Matrix generation, entering a vector, entering a matrix, matrix indexing	multiple data sets in one plot, specifying line styles and colors	flow structures, operator precedence, saving output to a file
S-2-3	SLO-1	To provides the Thresholding an image and the evaluation of its histogram using histogram equalization and illustrates the relationship among the intensities (gray levels) of an image and its histogram	To perform the Two-dimensional Fourier transform operation in an image.	Image Edge Detection Using Sobel Filtering and Canny Filtering	To perform the following operations in an image. (a) opening, (b) closing	Image filtering in spatial and frequency domain
	SLO-2					
S-4	SLO-1	Working with variables- Creating SCI Lab/MATLAB variables, overwriting variable	Managing the workspace, keeping track of your work session	Colon operator, linear spacing, , creating a sub-matrix, dimension, matrix operations	Introduction to programming - Introduction, M-File Scripts, script side-effects, M-File functions	Debugging M-files- Debugging process, preparing for debugging, setting breakpoints,
	SLO-2	Error messages, making corrections	Entering multiple statements per line, miscellaneous commands	Functions matrix generators, special matrices, array and array operations, solving linear equations, other mathematical functions.	anatomy of a M-File function, input and output arguments, input to a script file, output commands	running with breakpoints, examining values, correcting and ending debugging, correcting an M-file

Duration (hour)		6	6	6	6	6
S-5-6	SLO-1 SLO-2	To shows image rotation, scaling, and translation using Geometric transformations.	To perform the Linear filtering using convolution in an image	To perform the following operations in an image. (a) erosion, (b) dilation,	Color image segmentation algorithm development	Morphological operations in analyzing image structures

Learning Resources	1. Digital Image Processing using MATLAB. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, Pearson Education, Inc., 2004. 2. MATLAB: A Practical Introduction to Programming and Problem Solving. Stormy Attaway, Butterworth-Heinemann.	3. https://www.mathworks.com/content/dam/mathworks/mathworks-dot-com/moler/exm/book.pdf 4. https://www.mathworks.com/help/releases/R2014b/pdf_doc/matlab/getstart.pdf

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%
Level 2	Apply Analyze	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Level 3	Evaluate Create	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	Total	100 %		100 %		100 %		100 %		-	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert from TCS		Dr.P.Kanmani

Professional Elective – 1

Course Code	18CSE361J	Course Name	CONVERSATIONAL SYSTEMS	Course Category	*E*	Professional Elective	L	T	P	C
							2	0	2	3

Pre-requisite Courses	*Nil*	Co-requisite Courses	*Nil*	Progressive Courses	*Nil*
Course Offering Department	*Computer Science and Engineering*	Data Book / Codes/Standards	*Nil*		

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	*Understand the impact of AI on conversational systems*			
CLR-2 :	*Explore the underlying technologies for a conversational system*			
CLR-3 :	*Acquire knowledge in various NLP techniques*			
CLR-4 :	*Experience the design of various kind of chatbots*			
CLR-5 :	*Explore the scope of contact centers, deployment and its implication*			
CLR-6 :	*Acquire knowledge in advanced dialog management systems*			

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	*Comprehend the underlying technologies behind a conversational system*	*3*	*80*	*80*	*M*	*M*	*L*	*H*	*L*	-	-	-	*L*	*L*	-	*H*	-	-	-
CLO-2 :	*Demonstrate Natural Language Processing techniques using Python*	*3*	*85*	*75*	*M*	*H*	*L*	*M*	*L*	-	-	-	*M*	*L*	-	*H*	-	-	-
CLO-3 :	*Design and deploy retrieval and generative chatbots*	*3*	*80*	*85*	*H*	*H*	*H*	*H*	*L*	-	-	-	*H*	*L*	-	*H*	-	-	-
CLO-4 :	*Create a digital virtual assistant application*	*3*	*85*	*80*	*M*	*H*	*H*	*H*	*L*	-	-	-	*H*	*L*	-	*H*	-	-	-
CLO-5 :	*Design and deploy an intelligent chatbot using Dialogflow*	*3*	*85*	*80*	*H*	*H*	*H*	*H*	*L*	-	-	-	*H*	*L*	-	*H*	-	-	-
CLO-6 :	*Develop a CNN and RNN deep learning model for word ordering and classification*	*3*	*80*	*85*	*H*	*H*	*H*	*H*	*L*	-	-	-	*H*	*L*	-	*H*	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	*Introduction to conversational system*	*Natural language processing*	*Fundamentals of Conversational systems*	*Introduction to popular chatbot frameworks*	*Role of ML in conversational systems*
	SLO-2	*Different modes of engagement for a human being*	*Brief history, Basic components*	*NLU, DM and NLG*	*Google dialog flow, Microsoft bot framework*	*ASR system*
S-2	SLO-1	*History of AI*	*Phases of NLP*	*Chatbot framework and architecture*	*Amazon lex, RASA channels: Facebook messenger, Google Home,*	*Advanced dialog management system*
	SLO-2	*Impact of AI on conversational systems*	*Application of chatbots*	*Conversational flow and design*	*Alexa, WhatsApp, Custom App*	*Example dialog management system*
S 3-4	SLO-1	*Lab 1: Basic syntax and variables in Python*	*Lab 4: Introduction to Natural Language Processing using Python: regular expression*	*Lab 7: Building a simple chatbot in Python*	*Lab 10: Simple Chatbot building for Facebook messenger*	*Lab 13: Getting words in order with convolutional neural networks*
	SLO-2					
S-5	SLO-1	*Underlying technologies*	*General Chatbot architecture*	*Intent classification*	*Introduction to contact centers*	*Language translation*
	SLO-2	*Natural language processing, Natural language generator*	*Basic concepts in chatbots*	*ML and DL based techniques*	*Impact and Terminologies*	*Emotion/sentiment analysis*
S-6	SLO-1	*Text to speech, Speech to text*	*Lexical knowledge network*	*Dialogue management strategies*	*CCAI Telecommunications*	*Information extraction*
	SLO-2	*Computer vision*	*Lexical analysis, Part of speech tagging*	*Natural language generation*	*Virtual agent/assistant*	*Overview on conversational analytics*
S	SLO-1	*Lab 2: Class/Objects in Python*	*Lab 5: Word tokenization using NLTK*	*Lab 8: Building a retrieval based chatbot*		

Duration (hour)		12	12	12	12	12
7-8	SLO-2				*Lab 11: Creating a virtual assistant using Python library functions*	*Lab 14: Sequence classification using LSTM Recurrent Neural Network*
S-9	SLO-1	*Messaging platforms*	*Semantic analysis, Word sense disambiguation*	*UX design*	*Fundamentals of building conversations with Dialogflow*	*Conversational metrics*
	SLO-2	*Facebook, WhatsApp*	*Information extraction*	*APIs and SDKs*	*Design, Intent, Entities, Action responses*	*Application of Conversational systems: Robot and sensory application*
S-10	SLO-1	*Smart speakers*	*Sentiment analysis*	*Usage of conversational design tools*	*Training the agent*	*XR technologies, XR-commerce*
	SLO-2	*Alexa, Google home and other new channels*	*Affective NLG*	*Example tools for conversational system develeopment*	*Testing tools*	*Future technologies and market innovations*
S 11-12	SLO-1 SLO-2	*Lab 3: scikit library functions in Python*	*Lab 6: Simple topic identification*	*Lab 9: Creating a generative chatbot in Python*	*Lab 12: Building an intelligent chatbot using Python and Dialogflow*	*Lab 15: Multi class text classification using LSTM*

Learning Resources	1. *Christopher Schmandt, "Voice Communication with computers Conversational systems", Van Nostrand Reinhold, 1993.* 2. *Parag Kulkarni, Prachi Joshi, "Artificial Intelligence – Building Intelligent System", PHI learning pvt Ltd, 2015* 3. *Hapke, Hannes Max, Hobson Lane, and Cole Howard. "Natural language processing in action", Manning publications 2019*	4. ***Srini Janarthnam, "Hands-On Chatbots and Conversational Ui Development: Build chatbots and voice user interfaces with Chatfuel, Dialogflow, Microsoft Bot Framework, Twilio, and Alexa Skills", Packt publishing, 2017*** 5. *Prebuilt agents | Dialogflow CX | Google Cloud* 6. *Building your own conversational voice AI with Dialogflow & Speech To Text in web apps. | Google Cloud - Community (medium.com)*

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
Level 2	Apply Analyze	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
Level 3	Evaluate Create	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert Member from TCS	-	*Dr.B.Baranidharan, SRMIST*

Course Code	18CSE362J	Course Name	CLOUD MICROSERVICES AND APPLICATION	Course Category	E	Professional Elective	L	T	P	C
							2	0	2	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Engineering	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	Comprehend fundamentals of cloud application development
CLR-2 :	Specify of Public Cloud Models
CLR-3 :	Design various Cloud Applications
CLR-4 :	Deployment of Cloud Applications using Cloud Native Services
CLR-5 :	Explore Cloud Application using Python Use cases
CLR-6 :	Understand the Cloud Security and Cloud pricing models

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcomes (PLO)													
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Comprehend Cloud fundamental Concepts	3	80	70	L	L	H	H	L	-	-	-	L	L	-	H	-	-	-
CLO-2 :	Demonstrate Cloud Service and Deployments Model	3	85	75	M	M	H	M	H	-	-	-	M	L	M	H	-	-	-
CLO-3 :	Deploy Cloud Applications using Devops and Docker	3	75	70	M	M	H	M	H	-	-	-	H	L	M	H	-	-	-
CLO-4 :	Explore Python Language and its functions	3	85	80	M	M	H	M	H	-	-	-	M	L	L	H	-	-	-
CLO-5 :	Developing and Deploying Real-time Cloud Applications	3	85	75	H	M	H	M	H	-	-	-	H	L	M	H	-	-	-
CLO-6 :	Explore Various Cloud security Threats and Mechanism.	3	80	70	L	H	H	L	L	-	-	-	L	L	-	H	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Cloud Introduction –NIST Definition	Application architectures-Monolithic & Distributed	Introduction to Devops	Introduction to Python	Cloud Application Development
	SLO-2	Cloud service Models - IaaS/ PaaS / SaaS	API Fundamentals	Devops fundamentals.	Phython Language	Cloud Application Deployment
S-2	SLO-1	Deployment Models –Public,Private,Hybrid and Community, Cloud Characteristics	Microservice fundamentals, Current system architecture, target system.	Devops Tools, Devops Tools usuage – Cloud Application developments	Data types, Variables	Cloud Application Execution, Applications using Containers
	SLO-2	Cloud Challenges –user, Service Provider end, Applications of Cloud	Microservice design approach, Spring boot project	Introduction to Containers, Containerization Process	Operators, String Operations	Testing the Cloud Application, Case study on Cloud Application
S 3-4	SLO-1	Lab 1: Cloud Architecture Design	Lab4 : API Development	Lab 7 :Devops- Cloud Application Development	Lab10: Cloud Application development using Python	Lab 13: Cloud Application Development
	SLO-2					
S-5	SLO-1	Cloud Enabling Technology	Cloud Native applications	Docker	Decision Making and Loops	Cloud Security Concepts
	SLO-2	Data Centre Technology	12 Factors App	Containerization of application	Python functions	Cloud Security Threats
S-6	SLO-1	Virtualization Technology, Web Technology	Application integration process, Apification Process	Application Deployment, Application Testing with Usecases	Custom functions, Organizing Python codes using function	Cloud Security Mechanisms: Encryption, Hashing: Digital Signature
	SLO-2	Multitenant Technology, Service Technology	Microservice Management, API Management	Kubernetes, Kubernetes Objects	Lists,Tuples, Plotting Data	Public Key Infrastructure, Identity and Access Management
S	SLO-1	Lab 2: Microservice Architecture Design		Lab 8: Docker Containerization	Lab 11:Data visualization using Python	Lab 14: Cloud Security Case Study

Duration (hour)		12	12	12	12	12
7-8	SLO-2		*Lab 5: Design of Micro service and deployment*			
S-9	SLO-1	*Cloud components Guiding Principles: Utilization*	*Cloud Infrastructure Mechanisms:*	*Kubernetes Scheduler*	*packages*	*Single Sign-On: Kerberos authentication*
	SLO-2	*Security and Pricing*	*Logical Network Perimeter*	*Deployment of Kunbernetes*	*File I/O*	*One-time password*
S-10	SLO-1	*Overview on Public Cloud Platforms-AWS, Amazon Web Services (AWS)*	*Virtual Server: Cloud Storage Device, Cloud Usage Monitor*	*Kubernetes Applications, Kubernetes Tools*	*Text,CSV, Binary files, Exception Handling*	*Mobile Cloud, Green Cloud*
	SLO-2	*Azuer, Google Cloud Platform (GCP)*	*Resource Replication, Readymade Cloud Environment*	*Operating Clusters and Scaling, Cluster Architecture*	*Types of Exceptions, Python Use cases*	*Multicloud Models, Cloud Application development scenario*
S 11-12	SLO-1	*Lab 3: AWS Lambda Functions*	*Lab 6: API for Managing Virtual Infrastructure*	*Lab9: Cloud Scaling*	*Lab 12: Exception Handling using Python*	*Lab 15 :Project work*
	SLO-2					

Learning Resources	
1. *Thomas Erl, ZaighamMahmood,RichardoPuttini, "Cloud Computing:Concepts, Technology and Architecture", Fourth Printing, 2014, Prentice Hall/PearsonPTR, ISBN: 9780133387520.* 2. *ArshdeepBahga, Vijay Madisetti, "Cloud Computing: A Hands-On Approach", 2016, University Press, ISBN: 9780996025508.* 3. *K.Chandrasekaran, "Essentials of Cloud Computing", 2014, Chapman and Hall/CRC Press, ISBN 9781482205435.*	4. *John V Guttag, "Introduction to Computation and Programming Using Python" 2nd Edition, MIT Press 2017* 5. *Nischay kumar Hegde , "Python Programming Fundamentals - A Beginner's Handbook",Educreation Publishing, ISBN: 9781545713556 ,2018* 6. *Cloud Native DevOPS with Kubernetes , John Arundel,Justin domingus, OReilly Publisher ,2019*

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Understand										
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze										
Level 3	Evaluate	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Create										
	Total	100 %		100 %		100 %		100 %		-	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert Member from TCS	-	*Dr.S.Ramamoorthy SRMIST*

Course Code	18CSE363J	Course Name	MACHINE LEARNING	Course Category	E	Professional Elective	L	T	P	C
							2	0	2	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Engineering	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
CLR-1 :	Understand the basic concepts of machine learning	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-2 :	Gain knowledge about neural networks and apply them			
CLR-3 :	Learn the concepts and implementation of the various supervised learning algorithms			
CLR-4 :	Learn the concepts and implementation of unsupervised learning and reinforcement learning algorithms			
CLR-5 :	Learn to evaluate machine learning algorithms using performance assessment techniques			
CLR-6 :	Gain an overall understanding of the fundamentals of machine learning and its implementation in Python			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning		
		1	2	3
CLO-1 :	Explain the basic concepts of machine learning	2	85	80
CLO-2 :	Apply neural networks to appropriate applications	2	80	70
CLO-3 :	Implement supervised learning algorithms in Python	2	85	75
CLO-4 :	Implement unsupervised learning and reinforcement learning algorithms	2	85	75
CLO-5 :	Apply performance assessment techniques to evaluate machine learning algorithms	2	75	70
CLO-6 :	Apply machine learning concepts to different contexts and assess them	3	85	75

		Program Learning Outcomes (PLO)														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Explain the basic concepts of machine learning	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-2 :	Apply neural networks to appropriate applications	H	L	H	L	-	-	-	-	-	-	-	-	-	-	-
CLO-3 :	Implement supervised learning algorithms in Python	H	-	H	-	-	-	-	-	-	-	-	-	-	-	-
CLO-4 :	Implement unsupervised learning and reinforcement learning algorithms	H	-	H	-	-	-	-	-	-	-	-	-	-	-	-
CLO-5 :	Apply performance assessment techniques to evaluate machine learning algorithms	H	H	M	L	-	-	-	-	-	-	-	-	-	-	-
CLO-6 :	Apply machine learning concepts to different contexts and assess them	H	L	H	L	-	-	-	-	-	-	-	-	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Introduction to Machine Learning, types	Introduction to Supervised learning	Introduction to neural networks, biological motivation	Introduction to Unsupervised learning	Assessing and Comparing Classification Algorithms: Cross-Validation and Resampling Methods
	SLO-2	Learning Problems	Linear Basis Function Models, The Bias-Variance Decomposition	Problems appropriate for Neural Network learning, Neural Network Representation	Mixture Models and EM	K-Fold and 5x2 Cross-Validation
S-2	SLO-1	Supervised Learning, Unsupervised Learning	*Simple Linear regression*	*Perceptron learning*	K-Means Clustering, Spectral Clustering	Bootstrapping
	SLO-2	Concept Learning	Multiple Linear Regression	Multilayer Networks and Back Propagation Algorithms	Dirichlet Process Mixture Models	Measuring Error
S-3-4	SLO-1	Lab 1: Basic Programming in Python	Lab 4: Implementation of Linear Regression using Scikit-Learn	Lab 7: Implementation of Neural networks using Scikit-Learn	Lab 10: Implementation of SVM using Scikit-Learn	Lab 13: Implementation of Cross-validation
	SLO-2					
S-5	SLO-1	Version Spaces and Candidate Eliminations	Linear Models for Classification	Gradient descent and the delta rule	The Curse of Dimensionality, Dimensionality Reduction	Assessing a Classification Algorithm's Performance: Binomial Test
	SLO-2	Inductive Bias, The Bias-Variance Tradeoff	Probabilistic Generative Models, discriminative models	Feedforward networks	Principal Component Analysis	Approximate Normal Test, Paired t Test
S-6	SLO-1	The Curse of dimensionality	Logistic Regression	Generalization, Overfitting and stopping criterion	Latent Variable Models(LVM)	Comparing Two Classification Algorithms

Duration (hour)		12	12	12	12	12
	SLO-2	Over fitting and under fitting	k-Nearest Neighbors	Tuning the network size	Latent Dirichlet Allocation (LDA)	McNemar's Test
S-7-8	SLO-1	Lab 2: Introduction to Scikit-Learn Library	Lab 5: Implementation of KNN using Scikit-Learn	Lab 8: Tuning the parameters of ANN	Lab 11: Implementation of K-means clustering using Scikit-Learn	Lab 14: Implementation of an example ML application
	SLO-2					
S-9	SLO-1	Regularization	Decision Trees	Time delay and recurrent neural networks	Reinforcement Learning and Q-Learning	Ensemble Methods
	SLO-2	Learning Curve	Random Forest model	Bayes Theorem	Convergence and experiment strategies	Bagging
S-10	SLO-1	Error and noise	Support Vector Machines	Naïve Bayes Classifier	Nondeterministic rewards and actions	Boosting
	SLO-2	Parametric vs. non-parametric models	SVM Kernel trick	Bayesian Belief networks	Temporal difference learning	Stacking
S-11-12	SLO-1	Lab 3: Basic Pre-processing of Data	Lab 6: Implementation of Decision tree using Scikit-Learn	Lab 9: Implementation of Naïve Bayes using Scikit-Learn	Lab 12: Implementation of reinforcement learning using Scikit-Learn	Lab 15: Implementation of an example ML application
	SLO-2					

Learning Resources	1. *Tom M. Mitchell, Machine Learning, McGraw-Hill Education (India) Private Limited.* 2. *Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012.*	3. *Ethem Alpaydin, Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.* 4. *Gavin Hackeling, Mastering Machine Learning with scikit-learn, Packt Publishing, 2017.*

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*20 %*	*20 %*	*20 %*	*20 %*	*20 %*	*20 %*	*20 %*	*20 %*	*20 %*	*20 %*
	Understand										
Level 2	Apply	*20 %*	*20 %*	*20 %*	*20 %*	*20 %*	*20 %*	*20 %*	*20 %*	*20 %*	*20 %*
	Analyze										
Level 3	Evaluate	*10 %*	*10 %*	*10 %*	*10 %*	*10 %*	*10 %*	*10 %*	*10 %*	*10 %*	*10 %*
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert Member from TCS	-	**Dr. S. Usha Kiruthika, SRMIST**

Professional Elective – 2

Course Code	18CSE364J	Course Name	Robotics and Embedded Systems	Course Category	E	Professional Elective	L	T	P	C
							2	0	2	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Engineering	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	Analyse the different of Industrial applications of robotics
CLR-2 :	Discuss the benefits of cognitive robotics with analysis and control
CLR-3 :	Demonstrate applications of computer vision in robotics
CLR-4 :	Implement the cloud computing technology in robotics
CLR-5 :	Utilize the Python and R programs for robotic applications

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcomes (PLO)													
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Analyse the embedded design in Industrial needs	3	80	70	M	H	M	H	L	M	H	H	L	L	M	H	L	L	L
CLO-2 :	Discuss basic concepts and technological advancements in AI and robotics	3	85	75	M	H	L	M	L	M	M	H	M	L	M	H	L	L	L
CLO-3 :	Construct skills of using advanced software for solving practical problems in robotics pertaining to various industries	3	75	70	M	H	M	H	L	M	M	H	M	L	H	H	M	M	M
CLO-4 :	Apply several statistical analysis techniques and business analytics for cognitive robotics	3	75	70	H	H	M	H	M	M	M	M	M	L	M	H	M	M	H
CLO-5 :	Apply the programming of robots using python and R languages.	4	85	80	H	H	M	H	H	M	L	M	M	L	M	H	H	H	H
CLO-6 :	Design the applications of each modules of robotics for real-time applications	4	85	80	H	H	H	H	H	M	L	M	L	L	M	H	H	H	H

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Introduction to Modern Day Robotics and their industrial applications	Introduction to Robotics: Analysis, Control, Applications	Deep learning core applications	Private Cloud Platforms -Robot as a Service in Cloud Computing	Quality of Service and Cyber security Communication Protocols -Analysis for the Robot Operating System
	SLO-2	Industry 4.0 Concept: Background of Industry 4.0 technologies	Introduction to computer vision and application of Vision Systems in Robotics	Deep learning business applications	Cloud Computing Technology and Its Application in Robot Control	Robotics systems communication- Threat modelling using ROS
S-2	SLO-1	Overview of Industry 4.0 technologies	Concepts of computer vision and the how vision systems are becoming essential part of Robotics	Data Science and Big Data in the context of Cognitive Robotics: Cognitive Technologies:	A Comprehensive Survey of Recent Trends in Cloud	Towards cloud robotic system: A case study of online co-localization for fair resource competence
	SLO-2	Implementation patterns in manufacturing companies.	Computer Vision: Models, Learning, and Inference	The Next Step Up for Data and Analytics in robotics	Robotics Architectures and Applications - Google's cloud robotics	A Case Study on Model-Based Development of Robotic Systems
S 3-4	SLO-1	Lab-1: LED Interfacing using Arduino - Simulation	Lab-4: Ultrasound sensor interfacing using Arduino.	Lab-7: Experiment on Deep Learning for computer vision.	Lab-10: Google's Cloud Robotics application	Lab-13: Mini Project using ROS
	SLO-2					
S-5	SLO-1	Evolution of Industrial Robots and their Applications.	Mastering Computer Vision with TensorFlow	Cognitive Deep Learning Technology for Big Data.	High computing needs of industrial automation and systems	Monti Arc with Embedded Automata
	SLO-2	Advancements in Robotics and Its Future Uses	2.x: Build advanced computer vision applications using machine learning and deep learning techniques	Cognitive Assistant Robots for Reducing Variability in Industrial Human-Robot Activities.	The role of cloud and open source software in the future of robotics.	Introduction to Python in robotics

Duration (hour)		12	12	12	12	12
S-6	SLO-1	*Types of robotics in various fields for applications*	*Machine Vision Applications Application areas for vision systems*	*Artificial Intelligence and Robotics: The Review of Reliability Factors Related to Industrial Robots*	*The Power of Cloud Robotics by Robotics Industry Association*	*Introduction to R Programming in the context of Robotics*
	SLO-2	*Technologies essential for Cognitive Robotics*	*Robot inspection case study-Autonomous driving using 3D imaging case study.*	*Failure analysis of mature robots in automated production*	*Basics of Robotic operating System: ROS for beginners an overview*	*Introduction to Python - Python Functions for Data Science*
S 7-8	SLO-1	*Lab-2: LCD & LDR Interfacing using Arduino*	*Lab-5: Design of Obstacle Sensing Robot.*	*Lab-8: Experiment on Factory Automation (Quality Control)*	*Lab-11: Basic Robotic Operating System*	*Lab-14: Mini Project using Python libraries*
	SLO-2					
S-9	SLO-1	*Computer systems and Technologies relevant to modern day robotics*	*AI in the context of Cognitive Robotics*	*Data Analytics for Predictive Maintenance of Industrial Robots*	*Introduction to the Robot Operating System (ROS) Middleware*	*Basic ROS Learning Python for robotics*
	SLO-2	*Robotic Process Automation: Overview of RPA and its applications-RPA,*	*and Role of AI in Robotics: Foundation for Advanced Robotics*	*Failure Is an Option: How the Severity of Robot Errors Affects Human Robot Interaction*	*Secure communication for the Robot Operating System*	*An introduction to R programing*
S-10	SLO-1	*Artificial Intelligence for Leaders*	*AI- A Concept for a Practical Robot Design Process.*	*Concepts of Cloud computing.*	*An Introduction to Robot Operating System*	*The R in Robotics rosR*
	SLO-2	*Cognitive Technologies for Leaders*	*Demo to train A Robot Using AI*	*Cloud platforms and it applications in Robotics*	*The Ultimate Robot Application Framework by Adnan*	*A New Language Extension for the Robot Operating System*
S 11-12	SLO-1	*Lab 3: Robotic Process Automation (RPA) for design of Bot.*	*Lab-6: Block world solving robot – Simulation*	*Lab-9: Sign operating robot using Computer Vision*	*Lab-12: Experiment on automation using ROS*	*Lab-15: Mini project using E in Robotics*
	SLO-2					

Learning Resources	
	1. *Saeed Benjamin Niku, "Introduction to Robotics: Analysis, Control, Applications", Wiley Publishers, 2nd edition,2011.* 2. *Simon J. D. Prince, "Computer Vision: Models, Learning, and Inference", Cambridge University Press, 2012.* 3. *Massimo Banzi, "Getting Started with Arduino" 2 nd edition. O'Reilly, 2011.* 4. *Francis X. Govers," Artificial Intelligence for Robotics: Build Intelligent Robots that Perform Human Tasks Using AI Techniques", Packt publishing,2018.* 5. *Subrata Ghoshal Cengage "Embedded Systems & Robots : Projects Using the 8051 Microcontroller Learning" Cengage Learning Asia; New edition.* 6. *Kevin M. Lynch, Frank C. Park "Modern Robotics mechanics, planning, controls" Cambridge university press-2017.*

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Understand										
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze										
Level 3	Evaluate	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert Member from TCS	-	*R. Rajkumar, Assistant Professor, SRMIST*

Course Code	18CSE365J	Course Name	Modern Web Application	Course Category	E	Professional Elective	L	T	P	C
							2	0	2	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Engineering	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	Learn the basic concepts in HTML, CSS, Javascript
CLR-2 :	Understand the responsive design and development
CLR-3 :	Know scripting languages.
CLR-4 :	Design a Website with HTML, JS, CSS / CMS - Word press
CLR-5 :	learn the web project management and maintenance process

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	Deploy Simple Web Applications	1	85	80
CLO-2 :	Design Website using HTML CSS and JS	2	85	75
CLO-3 :	Design Responsive Sites	2	80	70
CLO-4 :	Design interactive web pages using Scripting languages.	3	80	70
CLO-5 :	Manage, Maintain and Support Web Apps	3	80	75

Program Learning Outcomes (PLO)														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
H	-	H	H	H	-	-	-	-	-	-	M	-	-	-
H	-	H	H	H	-	-	-	-	-	-	-	-	-	-
H	-	H	H	H	-	-	-	-	-	-	M	-	-	-
H	-	M	-	H	-	-	-	-	-	-	M	-	-	-
H	-	M	-	H	-	-	-	-	-	-	M	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Introduction to Internet	CSS Syntax and structure, CSS rules for Backgrounds	Introduction to Java Scripts	PHP	PHP Database Connectivity
	SLO-2	World Wide Web	Colors and properties, Manipulating texts, Fonts, borders and boxes,	Objects in Java Script	Creating PHP Programs	Connecting to MySQL Server
S-2	SLO-1	History of the Internet & World	Margins, Padding Lists, CSS Positioning	Dynamic HTML with Java Script	Numbers and Strings	Selecting Databases
	SLO-2	History of the Internet and World	Animations, Tool-Tips, Style images,	Bootstrap- JS Alert	Literals and Variables	Checking for Errors
S 3-4	SLO-1	Lab 1: Design the following static web pages required for an online book store web site. HOME PAGE:	Lab 4: Design the following static web pages required for an online book store web site. REGISTRATION PAGE:	Lab 7 : Write an XML file which will display the Book information	Lab10: Write Program in PHP to demonstrate basics of PHP	Lab 13: Install a database (Mysql). Create a table For basic information
	SLO-2					
S-5	SLO-1	Uniform Resource Locator, Tools and Web Programming Languages.	Variables, Media Queries, Wildcard Selectors	JS Button, JS popover	Simple Applications Demo	Closing the MySQL Server Connection
	SLO-2	Web Standards	Working with Gradients, Pseudo Class	Extensible Markup Language(XML)	Operators and Functions	Simple Applications Demo
S-6	SLO-1	Categories of Web Applications	Pseudo elements, basic of frameworks like Bootstrap	Structuring Data, Document Type Definition	Creating Form Controls	Manipulating Data in MySQL Using PHP models, Estimation of ARMA models such as Yule-Walker estimation for AR Processes
	SLO-2	Hypertext Mark Up Language (HTML)	Need for Scripting languages	XML Vocabularies	Simple Applications Demo	Inserting
	SLO-1					

Duration (hour)		12	12	12	12	12
7-8	SLO-2	*Lab 2: Design the following static web pages required for an online book store web site. LOGIN PAGE, CATOLOGUE PAGE*	*Lab 5: Design the following static web pages required for an online book store web site. VALIDATION*	*Lab 8: Write a Document Type Definition (DTD) to validate the above XML file.*	*Lab 11: Convert all the previous forms to PHP forms.*	*Lab 14 Work on case study*
S-9	SLO-1	*Basic HTML page, Text Formatting,*	*Types of scripting languages*	*Document Object Model (DOM)*	*Using Values Returned From*	*Viewing, Updating*
	SLO-2	*Table, Headers*	*Client side scripting*	*Document Object Model (DOM) with JavaScript*	*Simple Applications Demo*	*Deleting Records*
S-10	SLO-1	*Linking, Images,List*	*Server side scripting*	*Extensible Stylesheet Language Transforms (XSL)*	*Forms Using PHP*	*User Authentication: Creating Session*
	SLO-2	*Meta Elements*	*Simple Applications Demo*	*Simple Applications Demo*	*Introduction to nonparametric regression methods*	*Authorization Level*
S 11-12	SLO-1	*Lab 3: Design the following static web pages required for an online book store web site. CART PAGE:*	*Lab 6: Design the following static web pages required for an online book store web site. VALIDATION*	*Lab9: Write a Document Type Definition (DTD) to validate the above XML file.*	*Lab 12: Write a PHP Code to make database connection, Create Data Base, Create Table In Mysql*	*Lab15: Work on case study*
	SLO-2					

Learning Resources	
	1. *Web Programming, building internet applications, Chris Bates 2nd edition, WILEY Dreamtech.* 2. *HTML & CSS: Design and Build Websites, Jon Duckett, John Wiley & Sons* 3. *Naramore E., Gerner J., Scouarnec Y.L., et al., (2005) Beginning PHP5, Apache, MySQL Web Development: Programmer to Programmer, John Wiley & Sons Inc., ISBN: 9780764579660.*

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Understand										
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze										
Level 3	Evaluate	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Create										
	Total	100 %		100 %		100 %		100 %		100%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert member from TCS		*Dr.E.Sasikala*

Course Code	18CSE366J	Course Name	DATA MINING AND ANALYTICS	Course Category	E	Professional Elective	L	T	P	C
							2	0	2	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Engineering	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLR-1 :	Understand multidisciplinary field of Data Mining																		
CLR-2 :	Describe basic techniques for Data Pre Processing and Knowledge representation																		
CLR-3 :	Familiarize different types of Data Mining Algorithms																		
CLR-4 :	Know how to implement Descriptive analytics, Linear model and Non Linear Regression																		
CLR-5 :	Understand the concepts of Time series analysis and Linear time series models																		
CLR-6 :	Develop skills of using data mining algorithms in different domains																		
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																		
CLO-1 :	Restate the concepts and techniques of Data Mining	1	85	80	M	-	-	H	M	-	-	-	-	-	-	M	-	-	-
CLO-2 :	Develop skills of using data mining software for solving practical problems	2	85	75	M	-	M	-	H	-	-	-	-	-	-	-	-	-	-
CLO-3 :	Apply several statistical analysis techniques	2	80	70	H	M	L	-	-	-	-	-	-	-	-	L	-	-	-
CLO-4 :	Demonstrate the concept of Descriptive analysis	3	80	70	H	-	M	-	H	-	-	-	-	-	-	M	-	-	-
CLO-5 :	Infer about time series and Linear time series models	3	80	75	H	-	M	-	H	-	-	-	-	-	-	M	-	-	-
CLO-6 :	Practice and gain confidence and competence of data mining in real world problems	3	80	70	L	-	-	H	H	-	-	-	H	-	-	H	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Introduction to Data Mining	Data pre-processing	Data mining algorithms	Descriptive analytics: Data Modeling, Trend Analysis, Simple Linear Regression Analysis	Auto - Covariance
	SLO-2	What is data mining?	Data cleaning	Association rules	Forecasting models: Heuristic methods-predictive modeling and pattern discovery	Auto-correlation and their properties
S-2	SLO-1	What kinds of data can be Mined. Related technologies	Data transformation, Data reduction	Motivation and terminology, Example: mining weather data	Logistic Regression: Logit transform, ML estimation, Tests of hypotheses	Exploratory time series analysis, Test for trend and seasonality
	SLO-2	, Which Kinds of Applications are Targeted, Major Issues in Data Mining	Discretization and generating concept hierarchies, Installing Weka 3 Data Mining System	Basic idea: item sets, Generating item sets and rules efficiently	Wald test, LR test, score test, test for overall regression, multiple logistic regression, forward, backward method	Exponential and moving average smoothing, Holt, Winter smoothing, forecasting based on smoothing
S 3-4	SLO-1	Lab 1: Demonstration of preprocessing on dataset student.arff	Lab 4: Demonstration of Association rule process on dataset test.arff using apriori algorithm	Lab 7 : Demonstration of classification rule process on dataset employee.arff using naïve bayes algorithm	Lab10: Implementation of Logistic Regression	Lab 13: Implementation of Multicollinearity and Ridge Regression
	SLO-2					
S-5	SLO-1	Data Objects and Attribute Types	Experiments with Weka - filters	Correlation analysis	interpretation of parameters	Linear time series models – Autoregressive
	SLO-2	Basic Statistical Descriptions of Data	discretization	Classification: Basic learning/mining tasks	relation with categorical data analysis	Moving Average
S-6	SLO-1	Machine Learning, Supervised Learning	Data mining knowledge representation, Task relevant data	Inferring rudimentary rules:, One R algorithm	Interpreting Regression Models, Implementing Predictive Models, Generalized Linear model: link functions such as Poisson, binomial, inverse binomial, inverse Gaussian, Gamma.	Autoregressive Moving Average and Autoregressive Integrated Moving Average models, Estimation of ARMA models such as Yule-Walker estimation for AR Processes

Duration (hour)		12	12	12	12	12
	SLO-2	*Unsupervised Learning, Reinforcement Learning*	*Background knowledge, Representing input data and output knowledge*	*Decision trees, covering rules*	*Non Linear Regression (NLS): Linearization transforms, their uses and limitations, examination of non-linearity, initial estimates*	*Maximum likelihood and least squares estimation for ARMA Processes, Forecasting using ARIMA models*
S 7-8	SLO-1	*Lab 2: Demonstration of preprocessing on dataset labor.arff*	*Lab 5: Demonstration of classification rule process on dataset student.arff using j48 algorithm*	*Lab 8: Demonstration of classification rule process on dataset employee.arff using Decision trees algorithm*	*Lab 11: Implementation Non Linear Regression*	*Lab 14: Implementation of ARMA model*
	SLO-2					
S-9	SLO-1	*DBMS, OLAP*	*Visualization techniques, Attribute-oriented analysis*	*Prediction, The prediction task*	*iterative procedures for NLS, grid search, Newton-Raphson*	*Prescriptive Analytics, Mathematical optimization*
	SLO-2	*Data Mining Techniques, Stages of the Data Mining Process*	*Attribute generalization, Attribute relevance*	*Statistical (Bayesian) classification, Bayesian networks*	*steepest descent, Marquardt's methods, Introduction to semiparametric regression models*	*Networks modeling, Multi-objective optimization*
S-10	SLO-1	*Knowledge Representation Methods*	*Class comparison*	*Instance-based methods (nearest neighbor)*	*additive regression models*	*Stochastic modeling*
	SLO-2	*Applications*	*Statistical measures*	*linear models*	*Introduction to nonparametric regression methods*	*Decision and Risk analysis, Decision trees*
S 11-12	SLO-1	*Lab 3: Demonstration of Association rule process on dataset contactlenses.arff using apriori algorithm*	*Lab 6: Demonstration of classification rule process on dataset employee.arff using id3 algorithm*	*Lab9: Demonstration of clustering rule process on dataset iris.arff using simple k-means*	*Lab 12: Build statistical models Simple Linear Regression*	*Lab15: Implement Poisson/Negative binomial regression using sample datasets.*
	SLO-2					

Learning Resources	1. *Jiawei Han and Micheline Kamber, "Data Mining: Concepts and Techniques", Morgan Kaufmann Publishers, 3rd ed, 2010.* 2. *Lior Rokach and Oded Maimon, "Data Mining and Knowledge Discovery Handbook", Springer, 2nd edition, 2010*	3. *Box, G.E.P and Jenkins G.M. (1970) Time Series Analysis, Forecasting and Control, Holden-Day.* 4. *Draper, N. R. and Smith, H. (1998). Applied Regression Analysis (John Wiley) Third Edition. Hosmer, D. W. and Lemeshow, S. (1989). Applied Logistic Regression (Wiley).*

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Understand										
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze										
Level 3	Evaluate	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Create										
	Total	100 %		100 %		100 %		100 %		100%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert member from TCS	-	*Dr.V.V.RAMALINGAM, SRMIST*

Professional Elective – 3

Course Code	18CSE467J	Course Name	Enterprise System	Course Category	E	Professional Elective	L	T	P	C
							2	0	2	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Engineering	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
CLR-1 :	Learn concepts, theories and processes in enterprise systems			
CLR-2 :	Demonstrate a critical understanding of enterprise systems			
CLR-3 :	Identify the factors that lead to the development and implementation of ERP systems			
CLR-4 :	Analyse internal and external dimensions of enterprise systems by using an enterprise system			
CLR-5 :	Communicate effectively in oral and written forms about enterprise systems and processes principles.			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	Design and deploy Simple Web Applications using MVC	1	85	80
CLO-2 :	Design SOA and ERP models	2	85	75
CLO-3 :	Design of CRM models	2	80	70
CLO-4 :	Design interactive network and application	3	80	70
CLO-5 :	Manage, Maintain and configuration of Networking	3	80	75

Program Learning Outcomes (PLO)															
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
H	-	M	M	H	-	-	-	-	-	-	M	-	-	-
H	-	H	M	H	L	L	-	-	-	L	-	-	-	-
H	-	H	H	H	-	-	-	-	-	L	M	-	-	-
H	-	M	-	H	-	-	-	-	-	-	M	-	-	-
H	-	M	-	H	-	-	-	-	-	-	M	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Overview of Database Management Systems.	Service Oriented Architecture (SOA)	Electronic Data Exchange	Overview of : MPLS	Hardware Architectures for Enterprise Systems
	SLO-2	Overview of Model - View - Control (MVC)	Principles of loose coupling, encapsulation	Customer Relationship Management (CRM)	Virtual Private Networks (VPN)	Servers
S-2	SLO-1	Control (MVC) method of software development in a 3 tier environment	Inter-operatibility	Customer Relationship Management (CRM)	Firewalls	Clustering
	SLO-2	Control (MVC) development in a 3 tier environment.	Web Services as the implementation vehicle protocols, usage	Supplier Relationship Management (SRM)	Network monitoring and enforcement of policies	Storage area networks
S 3-4	SLO-1	Lab 1: Create a Movie Database Application using MVC	Lab 4: Explore the client/server architecture of SAP. Learn how to use the user interface.	Lab 7 : A model of customer relationship management and business intelligence systems for catalogue and online retailers.	Lab10: Firewalls configuration	Lab 13: Work on case study
	SLO-2					
S-5	SLO-1	Tools and Technologies	Enterprise Resource Planning (ERP)	Security Issues - Authentication,	Software Acquisition Process	Storage units
	SLO-2	Brief overview of the following : Java server pages	systems and their architecture	Authorisation	Tendering; conditions of contract	Back-up strategies
S-6	SLO-1	Related Java Technologies	Overview of SAP and Oracle Applications	Access control	Commercial off the shelf software (COTS) versus Bespoke Implementations;	Local Area Network (LAN) technologies and products

Duration (hour)		12	12	12	12	12
	SLO-2	*Microsoft .NET framework*	*Generic ERP Modules : Finance*	*Roles; single-sign-on*	*Commercial off the shelf software (COTS) versus Bespoke Implementations;*	*Data Centres*
S 7-8	SLO-1	*Lab 2: Creating an ASP.NET MVC Web Application Project.*	*Lab 5: – – Create customer, material master data. Execute the Sales process in SAP.*	*Lab 8: A model of customer relationship management and business intelligence systems for catalogue and online retailers.*	*Lab 11: COTS configuration and Implementation*	Lab 14 Work on case study
	SLO-2					
S-9	SLO-1	*PHP*	*Generic ERP Modules : HR*	*Directory servers, Audit trails;*	*Total cost of ownership*	*Disaster recovery site design and implementation issues*
	SLO-2	*Ruby on Rails*	*Generic ERP Modules : , Materials Management*	*Digital signatures; Encryption: review of IPSec,*	*Total cost of ownership*	*Disaster recovery site design and implementation issues*
S-10	SLO-1	*Javascript*	*Generic ERP Modules : Investment, etc*	*SSL and other technologies;*	*Issues on using Open source software or free software*	*Hardware Acquisition Issues.*
	SLO-2	*Ajax.*	*Examples of Domain Specific Modules*	*Simple Applications Demo*	*Licensed software.*	*Hardware Acquisition Issues.*
S 11-12	SLO-1	*Lab 3: Creating an ASP.NET MVC Web Application Project.*	*Lab 6: Create vendor, material master data for purchasing.. Execute the Purchasing process in SAP*	*Lab9:* Work on case study.	*Lab 12: Work on case study.*	Lab15: Work on case study
	SLO-2					

Learning Resources	*1. Enterprise Resource Planning - Alexis Leon, Tata McGraw Hill.* *2. Enterprise Resource Planning – Diversified by Alexis Leon, TMH.* *3. Enterprise Resource Planning - Ravi Shankar & S. Jaiswal , Galgotia.*	*4. E-Business Network Resource planning using SAP R/3 Baan and Peoplesoft : A Practical Roadmap For Success By Dr. Ravi Kalakota*

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Understand										
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze										
Level 3	Evaluate	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Create										
	Total	100 %		100 %		100 %		100 %		100%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert member from TCS		*Dr.E.Sasikala, SRMIST*

Course Code	18CSE468J	Course Name	*Advanced Finance*	Course Category	*E*	Professional Elective	L	T	P	C
							2	0	2	3

Pre-requisite Courses	*Nil*	Co-requisite Courses	*Nil*	Progressive Courses	*Nil*
Course Offering Department	*College of Management*	Data Book / Codes/Standards	*Nil*		

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	*Understanding the basics of financial management and various sources of finance*			
CLR-2 :	*Gain knowledge on how to value shares and know about dividends*			
CLR-3 :	*Understand the reasons for business failures and how mergers helps in restructuring*			
CLR-4 :	*Ascertain knowledge of working capital and its importance*			
CLR-5 :	*Understand Derivatives and its impact in the stock market*			
CLR-6 :	*Obtain knowledge on the corporate finance*			

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	*Explain the various sources of finance and working of primary and secondary market*	*3*	*80*	*70*
CLO-2 :	*Gain knowledge on valuation of shares and payment of dividends*	*3*	*85*	*75*
CLO-3 :	*Learn of the benefits of mergers and takeovers*	*3*	*75*	*70*
CLO-4 :	*Define the importance of working capital in business*	*3*	*85*	*80*
CLO-5 :	*Know the working of Derivatives*	*3*	*85*	*75*
CLO-6 :	*Apply the knowledge of corporate finance*	*3*	*80*	*70*

Program Learning Outcomes (PLO)														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
L	*H*	-	*H*	*L*	-	-	-	*L*	*L*	-	*H*	-	-	-
M	*H*	*L*	*M*	*L*	-	-	-	*M*	*L*	-	*H*	-	-	-
M	*H*	*M*	*H*	*L*	-	-	-	*M*	*L*	-	*H*	-	-	-
M	*H*	*M*	*H*	*L*	-	-	-	*M*	*L*	-	*H*	-	-	-
H	*H*	*M*	*H*	*L*	-	-	-	*M*	*L*	-	*H*	-	-	-
L	*H*	-	*H*	*L*	-	-	-	*L*	*L*	-	*H*	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	*Introduction to Financial Management and its objectives*	*Valuation of Preference Shares*	*Corporate Restructuring, Reasons for Business Failures*	*Working Capital and its Features*	*Derivatives – meaning and features*
	SLO-2	*Source of Finance- Long Term Sources of finance- Share Capital – Equity and Preference*		*Mergers and Takeovers, Difference between Mergers and Takeovers*	*Factors Influencing Working Capital*	*How Derivatives Work?*
S-2	SLO-1	*Preference capital and its features*	*Valuation of Equity Shares*	*Types of Mergers*	*Monitoring and Control of Working Capital*	*Settlement of Derivatives*
	SLO-2	*Benefits of Equity Capital*		*Evaluation of Merger Proposals*	*Benefits of maintaining adequate working capital*	*Feature Contract, Forward Contract and its difference from feature contract*
S-3-4	SLO-1	*Online Display of BSE and NSE Website and explaining on the Indian Stock Market – Online using Fintech Lab*	*Worksheets on valuation of Preference and Equity Shares*	*Case Studies on Recent Mergers in India*	*Worksheet on Calculation of Working Capital*	*Online Display of Derivatives Market*
	SLO-2					
S-5	SLO-1	*Types of Preference Shares and Types of Debentures*	*Dividend – Features and Types-Traditional Approach of Dividend Payment, Modern Approachee*	*Take Over and Amalgamations - Procedures*	*Cash Management*	*Options, Swaps and Interest rate Payoff Diagrams*
	SLO-2	*Debentures and its Features and Other Sources of Finance*		*Leveraged Buyouts, Management Buyouts*	*Benefits of Cash Management*	*Pricing of Futures and Put Call Parity*
S-6	SLO-1	*Short term sources of Finance, Primary Market and Secondary Market*	*Dividend Relevance Model -M M Approach of Dividend*	*Financial Restructuring*	*Receivables Management*	*Option Pricing using Binomial Model*

Duration (hour)		12	12	12	12	12
	SLO-2	*Initial Public Offering, Pricing of Issues*			*Benefits of Receivables Management*	*Black Scholes Model*
S-7-8	SLO-1	*Online Display of NSE and BSE website and explain how trading and settlement takes place*	*Case Studies on Dividend*	*Worksheet – Simple calculations in Mergers*	*Worksheet – Calculation of Cash cycle*	*Worksheet – Calculation of Profit / Earnings on Derivatives*
	SLO-2					
S-9	SLO-1	*Valuation of Bonds*	*Stability of Dividend and Stock Split*	*Share Split*	*Receivables Management and its Benefits*	*Risk – Return Management*
	SLO-2		*Bonus Shares and its benefits*	*Consolidation*		*Benefits of Derivatives*
S-10	SLO-1	*Valuation of Bonds*	*Lease and types of lease*	*Cancelation of Paid up capital*	*EOQ Calculation*	*Credit swaps*
	SLO-2		*Evaluation of Lease Contract*			
S-11-12	SLO-1	*Work sheet on Bond Valuation*	*Worksheet on evaluation of Lease Contract and Hire Purchase Contract*	*Worksheet on calculation of Share Split and SWAP ratio*	*Worksheet on EOQ Calculation*	*Simple Case Studies on Derivatives*
	SLO-2					

Learning Resources	1. Brealey, Myers and Allen, Principles of Corporate Finance, 13th Edition 2020, Tatal Mc Graw Hill 2. Eugene F. Brigham, Joel F. Houston Fundamentals of Financial Management, 15th Edition, Senage Publications	*3.* Vishwanath, S. R. Corporate Finance: Theory and Practice. 2nd etition2013, Sage Publications *4.* Sashi K Gupta and R K Sharma, Financial Management,8th revised edition, 2017, Kalyani Publications.

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Understand										
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze										
Level 3	Evaluate	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Create										
	Total	100 %		100 %		100 %		100 %		100%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert Member form TCS		Dr. V. M. Ponniah, SRMIST
		Dr. K. T. Vijay Karthigeyan, SRMIST

Course Code	18CSE469J	Course Name	IMAGE PROCESSING AND PATTERN RECOGNITION	Course Category	E	Professional Elective	L	T	P	C
							2	0	2	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Engineering	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	learn real world image processing problems			
CLR-2 :	use fundamental techniques of image processing			
CLR-3 :	Apply image transformation in processing real-time images			
CLR-4 :	Utilize image filtering in real-time applications			
CLR-5 :	Study features extraction techniques in pattern recognition			
CLR-6 :	Interpret color image processing in real world applications			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Program Learning Outcomes (PLO)														
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
					Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Compare different methods for image acquisition, storage and representation in digital devices and computers	3	80	70	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-
CLO-2 :	Appreciate role of image transforms in representing, highlighting, and modifying image features	3	85	75	M	H	L	M	L	-	-	-	M	L	-	H	-	-	-
CLO-3 :	Interpret the mathematical principles in digital image enhancement and apply them in spatial domain and frequency domain	3	75	70	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-4 :	Apply various methods for segmenting image and identifying image components	3	85	80	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-5 :	Summarize different reshaping operations on the image and their practical applications	3	85	75	H	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-6 :	Identify image features extraction techniques.	3	80	70	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Introduction - Image processing systems	Intensity transformations: Enhancement	Segmentation: Pixel classification	Image/Object features extraction: Textural features	Colour image processing: Fundamentals of different colour models
	SLO-2	Image processing systems applications	Intensity transformations: contrast stretching	Grey level thresholding	gray level co-occurrence matrix	RGB, CMY, HSI, YCbCr, Lab
S-2	SLO-1	Basic image file formats	Intensity transformations: histogram specification	global/local thresholding	Moments	RGB, CMY, HSI, YCbCr, Lab
	SLO-2	Basic image file formats	Intensity transformations: local contrast enhancement	Optimum thresholding - Bayes analysis, Otsu method	Connected component analysis	RGB, CMY, HSI, YCbCr, Lab
S 3-4	SLO-1	Lab 1:read, access, and display digital image using MATLAB or SCI Lab	Lab 4:Image enhancement	Lab 7:Thresholding	Lab 10:features extraction	Lab 13: Distance transform
	SLO-2					
S-5	SLO-1	Image formation: Geometric models	Spatial filtering: Smoothing	Optimum thresholding - Bayes analysis, Otsu method	Convex hull	False colour; Pseudo colour
	SLO-2	Image formation: photometric models	Spatial filtering: linear and order statistic filtering	Derivative based edge detection operators	Distance transform	False colour; Pseudo colour
S-6	SLO-1	Digitization - sampling	Spatial filtering: linear and order statistic filtering	edge detection/linking	medial axis transform	Enhancement; Segmentation

Duration (hour)		12	12	12	12	12
	SLO-2	*Digitization - sampling*	*sharpening*	*Canny edge detector*	*skeletonization/thinning, shape properties*	*Enhancement; Segmentation*
S 7-8	SLO-1	*Lab 2: Sampling*	*Lab 5: Histogram*	*Lab 8: Edge detection*	*Lab 11: Connected component analysis*	*Lab 14: Color image enhancement, Segmentation*
	SLO-2					
S-9	SLO-1	*Image definition and its representation*	*spatial convolution*	*Region growing*	*Registration: Mono-modal/multimodal image registration*	*Morphological Filtering Basics: Dilation and Erosion Operators*
	SLO-2	*Image definition and its representation*	*Gaussian smoothing*	*split/merge techniques*	*Global/local registration*	*Morphological Filtering Basics: Dilation and Erosion Operators*
S-10	SLO-1	*neighbourhood metrics*	*DoG, LoG*	*line detection*	*Transform and similarity measures for registration*	*Top Hat Filters*
	SLO-2	*neighbourhood metrics*	*DoG, LoG*	*Hough transform*	*Intensity/pixel interpolation*	*Top Hat Filters*
S 11-12	SLO-1	*Lab 3: neighbourhood metrics*	*Lab 6: Smoothing*	*Lab 9: Hough transform*	*Lab 12: skeletonization/thinning*	*Lab 15: Dilation and Erosion Operators*
	SLO-2					

Learning Resources	
1. *R. C. Gonzalez and R. E. Woods, Digital Image Processing, 4th ed., Prentice Hall, 2018* 2. *Maria Petrou and Panagiota Bosdogianni, Image Processing: The Fundamentals, 2nd ed., John Wiley & Sons, 2010* 3. *K. R. Castleman, Digital Image Processing, Prentice Hall, Englewood Cliffs., 1995*	4. *A. Blake and A. Zisserman, Visual Reconstruction, MIT Press, Cambridge., 2003* 5. *A. N. Netravali and B. G. Haskell, Digital Pictures, 2nd ed., Plenum Press., 1995* 6. *A. B. Watson, Digital Images and Human Vision, MIT Press, Cambridge, 1993*

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*20%*	*20%*	*10%*	*10%*	*10%*	*10%*	*10%*	*10%*	*10%*	*10%*
	Understand										
Level 2	Apply	*20%*	*20%*	*30%*	*30%*	*30%*	*30%*	*30%*	*30%*	*30%*	*30%*
	Analyze										
Level 3	Evaluate	*10%*	*10%*	*10%*	*10%*	*10%*	*10%*	*10%*	*10%*	*10%*	*10%*
	Create										
	Total	100 %		100 %		100 %		100 %		100%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert Member from TCS	-	*Dr. S. Sudhakar, SRMIST*

Professional Elective – 4

Course Code	18CSE461J	Course Name	Cognitive Science & Analytics	Course Category	E	Professional Elective	L	T	P	C
							2	0	2	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Engineering	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	To know concepts, approaches and issues in the field of cognitive science
CLR-2 :	To increase the awareness of the students to the questions raised in the disciplines of computer science, linguistics, philosophy and psychology
CLR-3 :	To focus on the interaction of these disciplines in approaching the study of the mind
CLR-4 :	To make specialization on topics central to cognitive science such as the nature of mental representation, reasoning, perception, language use
CLR-5 :	To learn other cognitive processes of humans and other intelligent systems.

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Know Introduction to Cognitive Science, Psychology, Nervous system and brain	1	85	80	M	-	-	H	M	-	-	-	-	-	-	M	-	-	-
CLO-2 :	Explain Brain and sensory motor information, Representation of sensory information	2	85	75	M	-	M	-	H	-	-	-	-	-	-	-	-	-	-
CLO-3 :	Analyse From Sensation to Cognition; Roots of Cognitive Science	2	80	70	H	M	L	-	-	-	-	-	-	-	-	L	-	-	-
CLO-4 :	Develop Language and Embodiment	3	80	70	H	-	M	-	H	-	-	-	-	-	-	M	-	-	-
CLO-5 :	Implement Affordances in biological and artificial systems, Cognitive Development	3	80	75	H	-	M	-	H	-	-	-	-	-	-	M	-	-	-
CLO-6 :	Make Attention, Learning, Memory, Reasoning, Social Cognition.	3	80	70	L	-	-	H	H	-	-	-	H	-	-	H	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Introduction to the study of cognitive sciences.	Neural Network Models	What is language?	Affordances	Categories and concepts; Concept learning
	SLO-2	Introduction to the study of cognitive sciences.	Neural Network Models	Linguistic knowledge: Syntax, semantics, (and pragmatics)	Direct perception	Logic; Machine learning
S-2	SLO-1	A brief history of cognitive science.	Processing of sensory information in the brain	Linguistic knowledge: Syntax, semantics, (and pragmatics)	Ecological Psychology	Constructing memories
	SLO-2	Methodological concerns in philosophy	Discretization and generating concept hierarchies, Installing Weka 3 Data Mining System	Generative linguistic	Affordance learning in robotics	Explicit vs. implicit memory
S 3-4	SLO-1	Lab 1: Overview and practice: Cognitive Science and its methodology concerns in philosopy	Lab 4: Overview and practice: Written materials needed to get a CogNeuro research study with human subjects off the ground: Runsheets, SOPs, questionnaires, informed consent forms.	Lab 7: Perform stemming operation in python using NLTK	Lab 10: Writing and running Robot programs – Activity of PICK and Place of an object.	Lab 13: Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
	SLO-2					
S-5	SLO-1	Artificial intelligence and psychology	Brain Imaging	Brain and language	Affordance learning in robotics	Information processing (three-boxes) model of memory

Duration (hour)		12	12	12	12	12
	SLO-2	*Structure and constituents of the brain*	*fMRI, MEG*	*Language disorders*	*Development*	*Information processing (three-boxes) model of memory*
S-6	SLO-1	*Brief history of neuroscience*	*PET, EEG*	*Lateralization*	*Child and robotic development*	*Sensory memory; Short term memory*
	SLO-2	*Mathematical models*	*Multisensory integration in cortex*	*Lateralization*	*Attention and related concepts*	*Long term memory; Rationality*
S 7-8	SLO-1	*Lab 2: Experimental approach to studying the working human brain and body. How to use Brain Voyager Brain Tutor How to use the BESA dipole simulator.*	*Lab 5: Introduction to EEG recordings. Theory, physiology, practical aspects of recording and analyzing scalprecorded brain potentials.*	*Lab 8: Perform lemmatization in python using NLTK*	*Lab 11: Make simulation model using Rockwell ARENA 11.0 to show the functions / predictions for a manufacturing work cell.*	*Lab 14: Evaluating ML algorithm with balanced and unbalanced datasets Comparison of Machine Learning algorithms.*
	SLO-2					
S-9	SLO-1	*Mathematical models*	*Information fusion*	*The great past tense debate*	*Human visual attention*	*Bounded rationality; Prospect theory ; Heuristics and biases*
	SLO-2	*Looking at brain signals*	*From sensation to cognition*	*The great past tense debate*	*Computational models of attention*	*Reasoning in computers*
S-10	SLO-1	*Looking at brain signals*	*Cybernetics*	*Cognitivist and emergent stand points*	*Computational models of attention*	*Key points in social cognition*
	SLO-2	*Processing of sensory information in the brain.*	*From physics to meaning, Analog vs. Digital: Code duality.*	*A robotic perspective*	*Applications of computational models of attentional*	*Context and social judgment; Schemas; Social signals*
S 11-12	SLO-1	*Lab 3: Experimental approach to processing sensory information in the brain using python.*	*Lab 6: EEG analysis: How to get from the raw recording to specific brain waves. An example analysis.*	*Lab 9: Perform parts of speech tagging in python using NLTK*	*Lab 12: Simulation modeling of four machine system using Rockwell ARENA 11.0.*	*Lab 15: Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same dataset for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.*
	SLO-2					

Learning Resources	
1. *Jiawei Han and Micheline Kamber, "Data Mining: Concepts and Techniques", Morgan Kaufmann Publishers, 3rd ed, 2010.* 2. *Lior Rokach and Oded Maimon, "Data Mining and Knowledge Discovery Handbook", Springer, 2nd edition, 2010*	3. *Box, G.E.P and Jenkins G.M. (1970) Time Series Analysis, Forecasting and Control, Holden-Day.* 4. *Draper, N. R. and Smith, H. (1998). Applied Regression Analysis (John Wiley) Third Edition. Hosmer, D. W. and Lemeshow, S. (1989). Applied Logistic Regression (Wiley).*

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Understand										
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze										
Level 3	Evaluate	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Create										
	Total	100 %		100 %		100 %		100 %		100%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert member from TCS		*Dr.C.N.Subalalitha*

Course Code	18CSE462J	Course Name	INTRODUCTION TO IOT	Course Category	E	Professional Elective	L	T	P	C
							2	0	2	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Engineering	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	Understand the basic principles, concepts, applications, and use cases of IoT			
CLR-2 :	Create and explain architecture of IoT for various domains			
CLR-3 :	Utilize sensors and transducers for data acquisition and industrial control systems			
CLR-4 :	Understand various networking technologies and apply these for communication in IoT settings			
CLR-5 :	Utilize resources for IoT processing, and apply techniques to deal with noisy data, missing data, anomalies, and outliers			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	Apply basic concepts of IoT and Use cases in various domains	3	80	70
CLO-2 :	Create the different types of IoT architecture and discuss working mechanisms of various components	3	85	75
CLO-3 :	Use the sensors and other resources for environmental setup of IoT system design and development	3	75	70
CLO-4 :	Apply networking technologies and establish communication among devices and software components	3	85	80
CLO-5 :	Implement IoT processing and data handling techniques	3	85	75

Program Learning Outcomes (PLO)														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
L	H	-	H	M	-	-	-	L	L	-	H	H	-	-
M	H	M	M	-	-	-	-	M	L	-	H	H	-	-
H	H	M	H	M	-	-	-	M	L	-	H		H	-
H	H	M	H	M	-	-	-	M	L	-	H		H	M
H	H	M	M	M	-	-	-	M	L	-	H	-	M	M

Duration (hour)		12	12	12	12	12
S 1	SLO-1	Introduction to IoT and Use cases	Architecture: IoT reference architectures	Sensors and Industrial System: Introduction to sensors and transducers	Networking and Communication for IoT: Recap of OSI 7 layer architecture and mapping to IoT architecture	IoT Data Processing and Storage- Introduction
	SLO-2					
S 2	SLO-1	Understanding basic concepts of IoT	Industrial Internet Reference Architecture	Integrating sensors to sensor processing boards	Introduction to proximity networking technologies (ZigBee, Bluetooth, Serial Communication)	Time series data and their characteristics
	SLO-2					
S 3-4	SLO-1	Lab 1: Setting up the Arduino Development Environment, connecting analog sensors to an Arduino Boarding and reading analog sensor data	Lab 4: Setup Python on the R Pi and run sample R Pi programs on the R Pi. Read the data from Arduino using Python language	Lab 7: Set up a MQTT broker on the PC. Send data from R Pi to PC using MQTT protocol. Receive data from PC to R Pi using MQTT protocol	Lab 10: Develop a mobile application to view the images captured by the R Pi camera.	Lab 13: Implement time series data analytics in Python using R Pi.
	SLO-2					
S 5	SLO-1	Consumer IoT vs Industrial Internet	Edge Computing	Introduction to industrial data acquisition systems	Industrial network protocols (Modbus, CANbus)	Time series databases
	SLO-2					
S 6	SLO-1	Fundamental building blocks	IoT Gateways	Examples of industrial data acquisition systems	Communicating with cloud applications - web services	Basic time series analytics
	SLO-2					
S 7-8	SLO-1	Lab 2: Digital Input and Output reading using Arduino board and Arduino Development Environment	Lab 5: Connect a R Pi Camera module to the Raspberry Pi and using Python programming capture still images and video	Lab 8: Connect LED lights to an Arduino. Connect the Arduino to the R Pi. Send Message from PC to R Pi via MQTT protocol. On receipt of the message , toggle the LED lights on the Arduino	Lab 11: Develop an application to demonstrate Edge detection in images.	Lab 14: Read weather data from CSV file, load the data and perform predictive data analytics to report weather of a particular location
	SLO-2					

Duration (hour)		12	12	12	12	12
S 9	SLO-1	*Use cases of IoT in industry domains*	*Data Ingestion and Data processing pipelines*	*Industrial control systems and their functions*	*REST, TCP/IP and UDP/IP sockets MQTT, Web sockets, protocols*	*Data summarization and sketching*
	SLO-2					
S 10	SLO-1	*Sample use cases for discussion*	*Data Stream Processing*	*Fault detection and controlling operations*	*Message encoding, JSON , Protocol Buffers*	*Dealing with noisy and missing data, Anomaly and outlier detection*
	SLO-2					
S 11-12	SLO-1	*Lab 3: Integrate an Arduino Board to a Raspberry Pi computer and send sensor data from Arduino to the R Pi.*	*Lab 6: Set up TCP/IP socket server on a PC. Send a message from the R Pi to the PC using socket communication.*	*Lab 9: Set up an account in a cloud service (such as Google / AWS or Azure). Set up a simple Http server using a language of your choice. Push the image captured from the R Pi camera to this web service. On receiving the image, store the image in a database or file.*	*Lab 12: Demonstrate video streaming using R Pi.*	*Lab 15: Demonstrate Outlier detection using R Pi.*
	SLO-2					

Learning Resources	1. *The Internet of Things, Samuel Greengard, MIT Press Essential Knowledge Series, Reference Books / Links:* 1. *Industrial Internet Reference Architecture - http://www.iiconsortium.org/IIRA.htm* 2. *World Economic Forum Report on Industrial Internet of Things - https://www.weforum.org/reports/industrial-internet-things* 3. *50 Sensor Applications for a Smarter World - http://www.libelium.com/resources/top_50_iot_sensor_applications_ranking/*	4. *Visualizing Data-Exploring and Explaining Data with the Processing Environment, By Ben Fry, Publisher: O'Reilly Media* 5. *Raspberry Pi Computer Architecture Essentials, by Andrew K Dennis* 6. *Getting Started with Arduino, M. Banzi, O Reilly Media* *GSMA IoT Security Guidelines & Assessment - https://www.gsma.com/iot/future-iot-networks/iot-security-guidelines/*

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Understand										
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze										
Level 3	Evaluate	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Create										
	Total	100 %		100 %		100 %		100 %		100%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert Member from TCS	-	*Dr. K. Dhanasekaran, SRMIST*

Course Code	18CSE463J	Course Name	CRYPTOLOGY	Course Category	E	Professional Elective	L	T	P	C
							2	0	2	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Engineering	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning
CLR-1 :	Understanding the Traditional Cryptography Techniques, Attacks, Services and Mechanisms as well Mathematical model used	1
CLR-2 :	Utilize the Symmetric Key Cryptography – Stream and Block Ciphers in real time applications	
CLR-3 :	Employ the Asymmetric Key Cryptography and Applying the modes of operation	
CLR-4 :	Applying the Key management and authentication mechanisms in real-time	
CLR-5 :	Understanding the Quantum Cryptography and its applications	

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	Able to do cryptanalysis on Traditional Ciphers also Analyze the different types of stream and block ciphers	3	80	70
CLO-2 :	Construct a Symmetric Key Cryptosystem based on stream or block cipher	3	85	75
CLO-3 :	Implement the Public Key Cryptosystem to ensure confidentiality and authentication for real time applications	3	75	70
CLO-4 :	Generate the Password and share among the users	3	85	80
CLO-5 :	Create PKI and apply Quantum Cryptography for real time system	3	85	75

Program Learning Outcomes (PLO)													
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
H	H	M	L	L	-	-	L	L	L	-	H	-	-	-
H	H	L	M	M	-	-	L	L	L	-	H	-	-	-
H	H	M	H	H	-	-	H	M	L	-	H	-	-	-
H	L	M	H	H	-	-	H	M	L	-	H	-	-	-
H	L	L	H	H	-	-	H	M	L	-	H	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Introduction to Cryptology – Cryptography & Cryptanalysis - Security Goals	Symmetric Key Cryptosystem: Stream Vs. Block Cipher	Modes of Operation	Key Management - Symmetric key distribution	Quantum Cryptography - Algorithm
	SLO-2	Types of Attacks	Stream Cipher, Block Cipher	ECB, CBC	Kerberos	Different approaches
S-2	SLO-1	Services and Mechanism, Techniques	RC4	CFB, OFB	Symmetric key agreement DH	Hash-based cryptography
	SLO-2	Traditional Ciphers – Substitution & Transposition cipher	A5/1	CTR	ECDH	Merkle signature scheme
S 3-4	SLO-1	Lab 1: Caesar's Cipher, Hill Cipher, Transposition Cipher	Lab4 :Implementation of RC4 & A5/1	Lab 7 :Implementation of CBC and CTR	Lab10: Implementation of ECDH	Lab 13: Implementation of Signature scheme
	SLO-2					
S-5	SLO-1	Divisibility and division algorithm	Grain family, Salsa,	Public Key Cryptography	Entity Authentication – Password	Code based Cryptography
	SLO-2	Euclidean Algorithm	ChaCha, HC128,	RSA	Fixed & One time password	Error-correcting codes
S-6	SLO-1	Groups, Rings and Fields	SNOW family	ECC	ZERO knowledge - Fiat-Shamir Protocol	Supersingular elliptic curve isogeny cryptography
	SLO-2	Finite fields of Form GF(p), GF(2^n)	ZUC	Digital Signature	Feige-Fiat-Shamir & Guillou-Quisquater Protocol	Symmetric key quantum resistance
S 7-8	SLO-1	Lab 2: Implementation of Euclidean Algorithm, Polynomial - Addition, subtraction, multiplication and Inverse	Lab 5: Implementation of FCSR based Stream Cipher	Lab 8: Implementation of RSA algorithm	Lab 11:Implementation of Entity authentication	Lab 14:Implementation of Digital signature scheme
	SLO-2					

Duration (hour)		12	12	12	12	12
S-9	SLO-1	*Use of Random Number Generation*	*DES*	*Hash Functions*	*Security Applications*	*Security reductions - Merkle signature scheme*
	SLO-2	*TRNG, PRNG and PRF*	*Strength of DES*	*SHA – 512*	*Generation of OTP*	*supersingular elliptic curve isogeny cryptography*
S-10	SLO-1	*Linear Congruential Generator*	*AES Key Expansion*	*Message Authentication code*	*Contact tracing – External functions*	*Comparison*
	SLO-2	*PRNG using Block Cipher modes of Operation*	*AES Algorithm*	*HMAC*	*Key Schedule*	*PKI*
S 11-12	SLO-1	*Lab 3: Implementation of CTR and OFB algorithm for PRNG*	*Lab 6: Implementation of DES and AES algorithm*	*Lab9: Implementation of SHA - 512 algorithm*	*Lab 12: HMAC designates the HMAC function using the SHA-256 hash function*	*Lab 15 :Implementation of PKI*
	SLO-2					

Learning Resources	
	1. *Cryptography, Theory and Practice. D. R. Stinson, CRC Press.* 2. *Handbook of Applied Cryptography. A. J. Menezes, P. C. van Oorschot, and S. A. Vanstone, CRC Press.* 3. *A course in number theory and cryptography. N. Koblitz:, GTM, Springer.* 4. *Cryptography and Network Security. W. Stallings, Prentice Hall.* 5. *Security Engineering, R. Anderson, Wiley*
	6. *RC4 Stream Cipher and Its Variants. G. Paul and S. Maitra: CRC Press, Taylor & Francis Group, A Chapman & Hall Book, 2012* 7. *Design & Cryptanalysis of ZUC - A Stream Cipher in Mobile Telephony. C. S. Mukherjee, D. Roy, S. Maitra, Springer 2020* 8. *Contact Tracing in Post-Covid World - A Cryptologic Approach. P. Chakraborty, S. Maitra, M. Nandi, S. Talnikar, Springer 2020* 9. *Presskil Lecture notes: Available online: http://www.theory.caltech.edu/~preskill/ph229/* 10. *Hook D, "The Bouncy Castle FIPS Java API in 100 Examples (Final Draft)", CERTOSS, 2016.*

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Understand										
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze										
Level 3	Evaluate	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Create										
	Total	100 %		100 %		100 %		100 %		100%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert Member from TCS	-	*Dr. R. Kayalvizhi, SRMIST*

Professional Elective – 5

Course Code	18CSE464J	Course Name	Quantum Computation & Quantum Information	Course Category	E	Professional Elective	L	T	P	C
							2	0	2	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Engineering	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	Apply the quantum computing algorithms and mechanics			
CLR-2 :	Produce Quantum Circuits			
CLR-3 :	Discuss Open source and on the cloud for quantum programing			
CLR-4 :	Compare Dense coding, Models of Computation			
CLR-5 :	Demonstrate the quantum Fourier transform and its applications			
CLR-6 :	Utilize Distance measures for quantum information, Quantum Error Correction and Quantum cryptography			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Identify the quantum computing algorithms and mechanics	3	80	70	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-
CLO-2 :	Create the various Quantum Circuits	3	85	75	M	H	L	M	L	-	-	-	M	L	-	H	-	-	-
CLO-3 :	Construct the Composing quantum programs at the level of circuits and pulses with the code foundation.	3	75	70	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-4 :	Create the Quantum algorithms and applications	3	85	80	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-5 :	Create the code for the Quantum error correction and noise	3	85	75	H	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-6 :	Construct the different Quantum simulators and noise models	3	80	70	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Need for Quantum Computing and fundamental concepts	Single qubit operations Measurement, Universal quantum gates Approximating arbitrary unitary gates is generically hard	The analysis of computational problems	Quantum key distribution (QKD)	Quantum Information Quantum noise and quantum operations
	SLO-2	Operators, Measurements	Quantum computational complexity	Perspectives on computer science	BB 84 protocol, B-92 and Eckart protocol	Classical noise and Markov processes
S-2	SLO-1	Quantum bits, Multiple qubits	Summary of the quantum circuit model of computation	Models of Computation	Semi-Quantum QKD protocols and their variations	Quantum operations, Examples of Quantum noise and quantum operations
	SLO-2	Quantum computing, Quantum algorithms	Simulation of quantum systems		Issues of Device Independence, Commercial products	Applications and limitations of quantum operations formalism, Distance measures for quantum information
S 3-4	SLO-1	Lab 1: Experimental quantum information processing	Lab 4: Projective measurement Grover's Search Algorithm	Lab 7: Controlled operations	Lab 10 : Quantum search algorithms	Lab 13: How close are two quantum states? How well does a quantum channel preserve information?
	SLO-2					
S-5	SLO-1	Quantum information	Quantum Fourier Transform	Quantum True Random Number Generators (QTRNG)	The quantum search algorithm, Quantum search as a quantum simulation	Quantum Error Correction, The Shor code, Quantum Error Correction Codes
	SLO-2	Introduction to quantum mechanics, Linear algebra	Period Finding	Detailed design and issues of quantumness	Quantum counting, Speeding up the solution of NP-complete problems	Classical Information Theory,

Duration (hour)		12	12	12	12	12
S-6	SLO-1	*The postulates of quantum mechanics*	*Method of Continued Fraction*		*Quantum search of an unstructured database*	*Shannon Entropy*
	SLO-2	*The postulates of quantum mechanics*	*Shor's Factorization Algorithm*		*Optimality of the search algorithm*	*Von Neumann Entropy*
S 7-8	SLO-1	*Lab 2: Qubits and Bloch Sphere*	*Lab 5: Deutsch Algorithm*	*Lab 8: Simon Problem*	*Lab 11: Black box algorithm limits*	*Lab 14: Quantum information theory*
	SLO-2					
S-9	SLO-1	*Basic Quantum Gates*	*Deutsch-Jozsa Algorithm*	*Commercial products and applications*	*Quantum computers: physical realization*	*Introductory topics in Post-Quantum Cryptography*
	SLO-2				*Guiding principles, Conditions for quantum computation*	*Post-Quantum Cryptography*
S-10	SLO-1	*Quantum Circuits*	*Implication of Shor's algorithm towards factorization and Discrete Logarithm based classical public key cryptosystems*	*Commercial products and applications*	*Harmonic oscillator quantum computer*	*Stateful Hash-Based Signatures*
	SLO-2	*Quantum Entanglement: Quantum Teleportation, Super-dense coding, CHSH Game*	*Implication of Grover's and Simon's algorithms towards classical symmetric key cryptosystems*		*Optical photon quantum computer, cavity quantum electrodynamics, Ion traps, Nuclear magnetic resonance, Other implementation schemes*	*Threshold Cryptography*
S 11-12	SLO-1	*Lab 3: Quantum programing: Open source and on the cloud prototype applications on the cloud*	*Lab 6: Running an experiment in the IBM quantum experience*	*Lab 9: Introduction to quantum computing programming with python and Qiskit*	*Lab 12: Open-Source Quantum Development Qiskit Terra: Composing quantum programs at the level of circuits and pulses with the code foundation.*	*Lab 15 : Qiskit Ignis: Addressing noise and errors Qiskit Aqua: Building algorithms and applications, Qiskit Aer: Accelerating development via simulators and noise models*
	SLO-2					

Learning Resources

1. *Quantum Computation and Quantum Information. M. A. Nielsen and I. L. Chuang, Cambridge University Press*
2. *Presskil Lecture notes: Available online: http://www.theory.caltech.edu/~preskill/ph229/*
3. *MichaelA. Nielsen and Issac L. Chuang," Quantum Computation and Information, Cambridge, 2002*
4. *Mikio Nakahara and Tetsuo Ohmi,"Quantum Computing", CRC Press, 2008*
5. *N. David Mermin,"Quantum Computer Science", Cambridge, 2007*
6. *https://qiskit.org/*
7. *An Introduction to Quantum Computing. P. Kaye, R. Laflamme, and M. Mosca, Oxford University Press, New York*
8. *Quantum Computer Science. N. David Mermin:, Cambridge University Press*
9. *Quantum Cryptography. D. Unruh:, Available online: https://courses.cs.ut.ee/all/MTAT.07.024/2017_fall/uploads/*
10. *NIST Post Quantum Cryptography, Available online: https://csrc.nist.gov/projects/post-quantum-cryptography/round-2-submissions*
11. *Quantum Algorithms for Cryptographically Significant Boolean Functions - An IBMQ Experience. SAPV Tharrmashastha, D. Bera, A. Maitra and S. Maitra, Springer 2020.*
12. *Quantum Algorithm Zoo. https://quantumalgorithmzoo.org/*
13. *Handbook of Applied Cryptography. A. J. Menezes, P. C. van Oorschot, and S. A. Vanstone. CRC Press*

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember / Understand	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
Level 2	Apply / Analyze	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
Level 3	Evaluate / Create	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Total	100 %		100 %		100 %		100 %		100%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert member from TCS		*Dr.Kavisankar*

Course Code	18CSE465J	Course Name	Advanced Social, Text and Media Analytics	Course Category	E	Professional Elective	L	T	P	C
							2	0	2	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Engineering	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	Utilize text mining techniques			
CLR-2 :	Utilize techniques and algorithms to analyze the web contents			
CLR-3 :	Utilize the information visualization techniques to visualize the social network contents			
CLR-4 :	Utilize the techniques to perform social media analytics			
CLR-5 :	Utilize algorithm social media analytics to extract meaningful information			
CLR-6 :	Utilize algorithms to analyze twitter and Facebook contents			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Analyze the use various tools for Text Mining	3	80	70	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-
CLO-2 :	Explain the concept of Pattern Discovery, Predictive Modeling	3	85	75	M	H	L	M	L	-	-	-	M	L	-	H	-	-	-
CLO-3 :	Explore the use of social network analysis to understand the growing connectivity and complexity around us	3	75	70	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-4 :	Define the influence of social networks on different scales – ranging from small groups to the World Wide Web	3	85	80	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-5 :	Perform social network analysis to identify important social actors, subgroups (i.e., clusters)	3	85	75	H	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-6 :	Analyze network properties in social media sites such as Twitter, Facebook, and YouTube	3	80	70	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Text Mining -Introduction	Web Analytics -Introduction	Social network web data and methods	Social Media Analytics (SMA)- Introduction	Understanding Twitter Analytics and Facebook Insights
	SLO-2	Core text mining operations	Web analytics tools	Graphs	Social media landscape	Brief history of Twitter
S-2	SLO-1	Preprocessing techniques, Categorization	Clickstream analysis, A/B testing	Matrices, Basic measures for individuals and networks	Why Social Media Analytics Matter, SMA in Small organizations	What is Twitter, a Social Network or a News Media?, Key features of Twitter
	SLO-2	Clustering, Information Extraction	online surveys, Web search and retrieval	Information visualization, Making connections	SMA in large organizations, Application of SMA in different areas	Hashtags on Twitter, Hashtag Categories
S 3-4	SLO-1	Lab 1: Implementation of Text	Lab4 :Implementation of Web Scraping	Lab 7 :Implementation of Information Visualization of text data	Lab10: Scraping and Extracting Conversational Topics on Internet Forums	Lab 13: Twitter data Analytics
	SLO-2	Classification and Text Clustering				
S-6	SLO-1	Methods & Approaches: :Probabilistic models for information Extraction, Text mining applications	Web crawling and Indexing, Search Engine Optimization (SEO)	Link analysis, Link-based Object Classification (LOC)	Types of social networks, Introduction	Information Diffusion, Online Information Diffusion
	SLO-2	Content Analysis, Natural Language Processing, Clustering & Topic Detection, Simple Predictive Modeling	On Page SEO, Page Tags ,Content Marketing, Off Page SEO, Link-building , Social Authority and Social Mentions	Link-based Object Ranking (LOR), Link prediction, Page Ranking, Random Graphs	Measurement of Social Network Data, Collection of Social Network Data, Visualizing the Data, Drawing Meaningful Insights	Persistence and Stickiness, Crawling Twitter Data, Understanding Twitter Data, Semantic Analysis on Twitter Data
S	SLO-1		Lab 5: Implementation of Web Crawler			

Duration (hour)		12	12	12	12	12
7-8	SLO-2	Lab 2: Implementation of Topic Detection for a given set of text corpus		Lab 8: Implementation of Drawing insights from visualization	Lab 11: Ideintifying the topic of a scraped data	Lab 14: Classification of Twitter Sentiments
S-9	SLO-1	Sentiment Analysis	Metrics	Network evolution.	Using that data for forecasts	Introduction to Facebook
	SLO-2	Sentiment Prediction	Google Analtics Basics	Social contexts	Monitoring Customer Engagement in Social Media	Types of Data on Facebook
S-10	SLO-1	Sentiment in Social Media, Impact of Sentiment Analysis in Social Media	Ranking Algorithms, Ranking Factors	Affiliation and identity, Social network analysis	Identifying Opinions through Sentiment Analysis, Topic Modeling	Analyze Facebook data using native analytics, Facebook Audience Insights
	SLO-2	Sentiment as a Classifiaction Task, Sentiment as a Clustering Task	Web traffic models. Modelling Factors	Social Networking Potential, Applications-Textual analysis applications and Internet applications	Leveraging Social Media, Identifying Influencers in Social Network	Collecting Facebook data, Classifying people and their intents based on Facebook content
S 11-12	SLO-1	Lab 3:Implementation of sentiment classification for text documents	Lab 6 Implementation of Web indexer	Lab9: Implementation of Information Extraction from Text data	Lab 12: Classsification of a scrapped data	Lab 15 : Classification of Facebook data
	SLO-2					

Learning Resources

1. Ronen Feldman and James Sanger, "The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data", Cambridge University Press, 2006.
2. Hansen, Derek, Ben Sheiderman, Marc Smith. 2011 Analyzing Social Media Networks with NodeXL: Insights from a Connected World, Morgan Kaufmann, 304
3. Avinash Kaushik. 2009. Web Analytics 2.0: The Art of Online Accountability.
4. Hanneman, Robert and Mark Riddle. 2005. Introduction to Social Network Method
5. Wasserman, S. & Faust, K. (1994). Social network analysis: Methods and applications. New York: Cambridge University Press.
6. Monge, P. R. & Contractor, N. S. (2003). Theories of communication networks. New York: Oxford University Press. http://nosh.northwestern.edu/vita.html

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert member from TCS	-	Dr.Subalalitha C.N, Associate Professor SRMIST

Course Code	18CSE466J	Course Name	MOBILE COMPUTING	Course Category	E	Professional Elective	L	T	P	C
							2	0	2	3

Pre-requisite Courses	NIL	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Engineering	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
CLR-1 :	Provide the basic concepts of wireless and communication networks	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-2 :	Explore the overview of mobile communications and its characteristics			
CLR-3 :	Develop skills of finding solutions and building software for mobile computing applications			
CLR-4 :	Enable students to know different multiple division techniques and existing wireless networks			
CLR-5 :	Build knowledge on various Mobile Computing Algorithms			
CLR-6 :	Impart the practical knowledge with networking tool			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Program Learning Outcomes (PLO)														
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
					Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Define the fundamentals of cellular architecture and its distribution	3	80	70	L	L	-	L	L	-	-	-	L	L	-	H	-	-	-
CLO-2 :	Analyze the various mobility models in location management and types of handoff	3	85	75	M	H	-	M	L	-	-	-	M	L	-	H	-	-	-
CLO-3 :	Acquire the knowledge of Frequency, Time, Code, Space Multiple Access control	3	75	70	M	H	L	H	L	-	-	-	M	L	-	H	-	-	-
CLO-4 :	Incorporate theoretical knowledge with NS3 and OMNET	3	85	80	M	H	L	H	H	-	-	-	H	L	-	H	-	-	-
CLO-5 :	Analyze the characteristics and application of Wireless sensor network	3	85	75	L	M		M	M	-	-	-	M	L	-	H	-	-	-
CLO-6 :	Obtain the knowledge of Direct spectrum and 5G cellular networks	3	80	70	M	L	-	M	H	-	-	-	L	L	-	H	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Overview of wireless and mobile infrastructure	Mobility models characterizing individual node movement(Markovian)	Wireless transmission fundamentals - Introduction to narrow and wideband systems	Routing in MANETs	Cognitive radio networks - Fixed spectrum access
	SLO-2	Preliminary concepts on cellular architecture	Mobility models characterizing individual node movement(Activity based)	Spread spectrum - Frequency hopping	Concepts of WSN	Dynamic spectrum access
S-2	SLO-1	Design objectives and performance issues	Mobility models characterizing the movement of groups of nodes(Reference point based group mobility model)	Introduction to MIMO	Wireless sensor networks - Basic architecture	Direct spectrum sensing
	SLO-2	Radio resource management and interface	Mobility models characterizing the movement of groups of nodes(Community based group mobility model)	MIMO Channel Capacity and diversity gain	Design objectives of WSN	Indirect spectrum sensing
S 3-4	SLO-1	Lab 1: Implement three nodes point – to – point network with duplex links between them. Set the queue size, vary the bandwidth and find the number of packets dropped.	Lab 4: Implement and study the performance of CDMA on NS3 (Using stack called Call net) or equivalent environment.	Lab 7: Create WIFI SIMPLE ADHOC MODE using NS 3	Lab 10: CREATING A SIMPLE WIFI ADHOC GRID using NS3	Lab 13: Describe the Modules for designing the TIC TOC application
	SLO-2					

Duration (hour)		12	12	12	12	12
S 5	SLO-1	*Propagation and path loss models*	*Static (Always vs. Never update, Reporting Cells, Location Areas)*	*Introduction to OFDM*	*Applications of WSN*	*Spectrum sharing*
	SLO-2	*Channel interference and frequency reuse*	*Dynamic location management schemes (Time, Movement, Distance, Profile Based)*	*MIMO-OFDM system*	*Sensing and communication range*	*Interoperability and co-existence issues*
S-6	SLO-1	*Cell splitting*	*Terminal Paging (Simultaneous paging, Sequential paging)*	*Multiple access control (FDMA, TDMA,*	*Coverage and connectivity*	*Applications of cognitive radio networks*
	SLO-2	*Channel assignment strategies*	*Location management and Mobile IP*	*Multiple access control (CDMA, SDMA)*	*Sensor placement*	*D2D communications in 5G cellular networks - Introduction to D2D communications*
S 7-8	SLO-1	*Lab 2: Create clusters using given set of frequencies for the Divided equal hexagons*	*Lab 5: Implementing NS 3 to connect WIFI TO BUS (CSMA)*	*Lab 8: Connect WIFI TO WIRED BRIDGING through NS 3*	*Lab 11: Describe a study about modeling concepts in OMNet++*	*Lab 14: Implement the functionality of the TIC TOC module*
	SLO-2					
S-9	SLO-1	*Overview of generations:- 1G to 5G*	*Overview of handoff process*	*Wireless local area network*	*Data relaying and aggregation*	*High level requirements for 5G architecture*
	SLO-2	*Location and handoff management - Introduction to location management (HLR and VLR)*	*Factors affecting handoffs and performance evaluation metrics*	*Wireless personal area network (Bluetooth and zigbee)*	*Energy consumption*	*Introduction to the radio resource management*
S 10	SLO-1	*Mobility models characterizing individual node movement (Random walk)*	*Handoff strategies*	*Characteristics and applications*	*Clustering of sensors*	*Power control and mode selection problems*
	SLO-2	*Mobility models characterizing individual node movement(Fluid flow)*	*Different types of handoffs (soft, hard, horizontal, vertical)*	*Coverage and connectivity problems*	*Energy efficient Routing (LEACH)*	*Millimeter wave communication in 5G*
S 11-12	SLO-1	*Lab 3: Study and Implement the performance of GSM on NS3 (Using MAC layer) or equivalent environment.*	*Lab 6: Implementing NS 3 to create WIFI SIMPLE INFRASTUCTURE MODE*	*Lab 9: Create WIFI TO LTE (4G) CONNECTION by NS 3 tool*	*Lab 12: Create a application in TIC TOC – Implement the initial steps by setting topology file*	*Lab 15: Compile and link the simulation of TIC TOC*
	SLO-2					

Learning Resources

1. *Mobile Communications. Jochen Schiller, Pearson Education.*
2. *Wireless Communications. Andrea Goldsmith, Cambridge University Press.*
3. *Wireless Communications: Principles and Practice. Theodore Rappaport, Pearson Education.*
4. *Wireless Communications.EzioBiglieri, MIMO, Cambridge University Press.*
5. *Handbook of Wireless Networking and Mobile Computing. Ivan Stojmenovic, Wiley.*
6. *Dynamic Location Management in Heterogeneous Cellular Networks. James Cowling,*
7. *MIT Thesis. http://people.csail.mit.edu/cowling/hons/jcowling-dynamic-Nov04.pdf*
8. *Location Management in Wireless Cellular Networks. Travis Keshav, https://www.cse.wustl.edu/~jain/cse574-06/ftp/cellular_location.pdf*
6. *Location Management in Wireless Data Networks. Fahd A. Batayneh, https://www.cse. wustl.edu/~jain/cse574-06/ftp/wireless_location.pdf*
7. *Principles of Mobile Communication. Gordon L. Stber, Springer.*
8. *Wireless Device-to- DeviceCommunications and Networks.Lingyang Song, DusitNiyato, Zhu Han, and Ekram Hossain, Cambridge University Press.*
9. *Principles of Cognitive Radio.EzioBiglieri, Andrea J. Goldsmith, Larry J. Greenstein, Narayan Mandayam and H. Vincent Poor, Cambridge University Press.*
10. *Wireless Sensor Networks: Architecturesand Protocols. Edgar H. Callaway, Jr. and Edgar H. Callaway, CRC Press.*
11. *A Discrete-Event Network Simulator. https://www.nsnam.org/docs/manual/html/index.html*

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Understand										
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze										
Level 3	Evaluate	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Create										
	Total	100 %		100 %		100 %		100 %		100%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert Member from TCS	-	*Dr. P. Kanmani, SRMIST*

Open Elective

Course Code	18CSO161T	Course Name	Behavioral Economics	Course Category	O	Open Elective	L	T	P	C
							2	1	0	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil-
Course Offering Department	College of Management	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	Gain understanding of basics of behavioural economics and its applications
CLR-2 :	Gain knowledge of the basics of choice theory and its applications
CLR-3 :	Acquire knowledge on different kinds of beliefs, heuristics and biases
CLR-4 :	Introduce the concept of Choice under Uncertainty and its theories
CLR-5 :	Understand Intertemporal choice and its theories
CLR-6 :	Obtain knowledge on the concepts of Strategic Choice, its theories and individual preferences

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Acquire understanding of basics of behavioural economics and its applications	3	80	70	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-
CLO-2 :	Acquire knowledge of the basics of choice theory and its applications	3	85	75	M	H	L	M	L	-	-	-	M	L	-	H	-	-	-
CLO-3 :	Appreciate the concepts of different kinds of beliefs, heuristics and biases	3	75	70	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-4 :	Apply the concept of Choice under Uncertainty and its theories	3	85	80	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-5 :	Apply the Intertemporal choice and its theories	3	85	75	H	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-6 :	Apply the knowledge on the concepts of Strategic Choice, its theories and individual preferences	3	80	70	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-

Duration (hour)		9	9	9	9	9
S-1	SLO-1	I. Introduction to Behavioral Economics	Beliefs, heuristics and biases	Choice under uncertainty -	Intertemporal choice - Geometric discounting	Strategic choice 1.Review of game theory and Nash equilibrium – strategies, information
	SLO-2	Meaning and significance of behavioural economics	Meaning and impact of Beliefs, heuristics and biases	Background	Preferences over time	Equilibrium in pure and mixed strategies
S-2	SLO-1	The neoclassical /standard model and behavioral economics in contrast	Revisiting rationality	Expected utility theory	Anomalies of inter-temporal decisions	Iterated games, bargaining, signaling, learning;
	SLO-2	Historical background;	Causal aspects of irrationality		Hyperbolic discounting	Applications – competitive sports, bargaining and negotiation, monopoly and market entry
S-3	SLO-1	Behavioral economics and other social sciences	Different kinds of biases and beliefs	Prospect theory	Instantaneous utility; Meaning	2. Individual preferences;
	SLO-2	Theory and evidence in the social sciences and in behavioral economics			Alternative concepts – future projection	choice anomalies and inconsistencies;
S-4	SLO-1	Applications – gains and losses,	Self-evaluation and self-projection	Other theories	Mental accounts	

Duration (hour)		9	9	9	9	9
	SLO-2	*money illusion, charitable donation*	*Inconsistent and biased beliefs*	*Reference points*		*social preferences; altruism; fairness; reciprocity; trust; learning; communication; intention*
S-5	SLO-1	*Basics of choice theory - Revisiting the neoclassical model*	*Probability estimation*	*Loss aversion*	*Heterogeneous selves*	*Demographic and cultural aspects*
	SLO-2	*Utility in economics and psychology*			*Procedural choice*	*Social norms;*
S-6	SLO-1	*Models of rationality*	*Trading applications – trade in counterfeit goods*	*Marginal utility*	*Policy analysis – mobile calls, credit cards,*	*compliance and punishment;*
	SLO-2	*Connections with evolutionary biology and cognitive neuroscience*			*organization of government*	*inequity aversion;*
S-7	SLO-1	*policy analysis – consumption and addiction,*	*Financial trading behavior*	*Decision and probability weighting*	*Applications – consumption and savings, clubs and membership*	*policy analysis – norms and markets, labor markets,*
	SLO-2	*environmental protection, retail therapy*				*market clearing, public goods;*
S-8	SLO-1	*applications – pricing, valuation, public goods,*	*Trade in memorabilia*	*Applications – ownership and trade, income and consumption,*	*Consumption planning*	*Applications – logic and knowledge, voluntary contribution,*
	SLO-2	*choice anomalies*		*Performance in sports*		*compensation design*
S-9	SLO-1	*Case Study Discussion*	*Case Study Discussion*	*Case Study Discussion*	*Case Study Discussion*	*Case Study Discussion*
	SLO-2					

Learning Resources	1. Wilkinson and M. Klaes, An Introduction to Behavioral Economics, Red Globe Press, 3rd Edition, 2018 2. Philip Corr and Anke Plagnol, Behavioral Economics: the basics, Routledge Press, 1st Edition, 2018	*3. Michelle Baddeley, Behavioral Economics: A Very Short Introduction, OUP Oxford, Illustrated Edition, 2017* *4. Richard H. Thaler, Misbehaving: The Making of Behavioral Economics, Penguin Publishers, 1st Edition, 2015*

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	*40 %*	-	*30 %*	-	*30 %*	-	*30 %*	-	*30%*	-
Level 2	Apply Analyze	*40 %*	-	*40 %*	-	*40 %*	-	*40 %*	-	*40%*	-
Level 3	Evaluate Create	*20 %*	-	*30 %*	-	*30 %*	-	*30 %*	-	*30%*	-
	Total	100 %		100 %		100 %		100 %		-	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert member from TCS		Dr. Kavitha Shanmugam, SRMIST

Course Code	18CSO162T	Course Name	COMPUTATIONAL FINANCE & MODELING	Course Category	o	Open Elective	L	T	P	C
							2	1	0	3

Pre-requisite Courses	*Nil*	Co-requisite Courses	*Nil*	Progressive Courses	*Nil*
Course Offering Department	*Computer Science and Engineering*	Data Book / Codes/Standards	*Nil*		

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	*Gain Understanding of existing financial models in a quantitative and mathematical way.*			
CLR-2 :	*Apply the quantitative tools to solve complex problems in the areas of portfolio management.*			
CLR-3 :	*Understand the concepts to solve problems in the area of risk management and financial engineering.*			
CLR-4 :	*Understand the approaches required to calculate the price of options.*			
CLR-5:	*Obtain Knowledge on the methods required to analyse information from financial data and trading systems.*			

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	*Apply the solution methodologies based on Finite differences, Monte Carlo methods and Lattice methods*	*3*	*80*	*70*
CLO-2 :	*Acquire the knowledge to implement solvers based on Monte Carlo and Finite differences for European financial derivatives.*	*3*	*85*	*75*
CLO-3 :	*Acquire understanding of the similarities and differences in efficiency, convergence rate and complexity for the methods.*	*3*	*75*	*70*
CLO-4 :	*Apply the concept about solvers for complex types of financial derivatives that can be developed, and for higher grades implement these solvers.*	*3*	*85*	*80*
CLO-5 :	*Apply the knowledge on advanced software for pricing of financial derivatives*	*3*	*85*	*75*

Program Learning Outcomes (PLO)														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
L	*H*	-	*H*	*L*	-	-	-	*L*	*L*	-	*H*	-	-	-
M	*H*	*L*	*M*	*L*	-	-	-	*M*	*L*	-	*H*	-	-	-
M	*H*	*M*	*H*	*L*	-	-	-	*M*	*L*	-	*H*	-	-	-
M	*H*	*M*	*H*	*L*	-	-	-	*M*	*L*	-	*H*	-	-	-
H	*H*	*M*	*H*	*L*	-	-	-	*M*	*L*	-	*H*	-	-	-

Duration (hour)		*9*	*9*	*9*	*9*	*9*
S-1	*SLO-1*	*Numerical methods relevant to integration*	*Black-Scholes framework* *Black-Scholes PDE*	*Financial Products and Markets*	*Application areas include the pricing of American options*	*Statistical Analysis of Financial Returns:*
	SLO-2	*Differentiation and solving the partial differential equations of mathematical finance*	*Simple European calls and puts; put-call parity.*	*Introduction to the financial market.*	*Application areas include the pricing of American options*	*Fat-tailed distributions*
S-2	*SLO-1*	*Examples of exact solutions including Black Scholes And its relatives*	*The PDE for pricing commodity and currency options.*	*The products which are traded in financial markets.*	*Pricing interest rate*	*skewed distributions*
	SLO-2	*Finite difference methods including algorithms*	*Discontinuous payoffs Binary options*	*The products which are traded in financial markets.*	*Pricing interest rate*	*outliers*
S-3	*SLO-1*	*Question of stability and convergence*	*Digital options.* *The Greeks: Theta, delta, gamma, vega & rho and their role in hedging*	*Equities*	*Dependent claims*	*stylized facts of volatility*
	SLO-2	*Question of stability and convergence*	*The mathematics of early exercise*	*Equities*	*Dependent claims*	*Implied volatility surface*
S-4	*SLO-1*	*Treatment of near and far boundary conditions*	*American options: perpetual calls and puts*	***Indices***	*.Credit risk*	*volatility estimation*

Duration (hour)		***9***	***9***	***9***	***9***	***9***
	SLO-2	*Treatment of near and far boundary conditions*	*optimal exercise strategy and the smooth pasting condition*	*Foreign exchange*	*Credit risk*	*Volatility estimation using high frequency data.*
S-5	*SLO-1*	*The connection with binomial models*	*Volatility considerations Actual, historical and Implied volatility*	***Commodities***	*Monte Carlo simulation*	*Copulas*
	SLO-2	*The connection with binomial models*	*local vol and volatility surfaces Simulation including random variable generation*			*Hedging in incomplete markets*
S-6	*SLO-1*	*Interest rate models, early exercise*	*variance reduction methods and statistical analysis of simulation output*	Option contracts	*The use of importance sampling for Monte Carlo simulation*	*American Options*
	SLO-2		*Pseudo random numbers, Linear congruential generator, Mersenne twister RNG*			*Exotic options*
S-7	*SLO-1*	*The corresponding free boundary problems*	*The use of Monte Carlo simulation in solving applied problems on derivative pricing discussed in the current finance literature.*	*Strategies for speculation*	*VaR for portfolios of options*	*Electronic trading*
	SLO-2		*The technical topics addressed include importance sampling, Monte Carlo integration*			*Jump Diffusion Processes*
S-8	*SLO-1*	*A brief introduction to numerical methods for solving multi-factor models.*	*Simulation of Random walk and approximations to diffusion processes.*	*Hedging*	*The use of importance sampling for Monte Carlo simulation of VaR for portfolios of options*	*High-dimensional covariance matrices*
	SLO-2		*Martingale control variables, stratification, and the estimation of the "Greeks."*			*Extreme value theory, Statistical Arbitrage*
S-9-	*SLO-1*	*Case Study Discussion*	*Case Study Discussion*	*Case Study Discussion*	*Case Study Discussion*	*Case Study Discussion*
	SLO-2					

Learning Resources	1. R. Seydel: Tools for Computational Finance, 2nd edition, Springer-Verlag, New York, 2004. 2. P. Glasserman: Monte Carlo Methods in Financial Engineering, Springer-Verlag, New York, 2004. 3. W. Press, S. Teukolsky, W. Vetterling and B. Flannery, Numerical Recipes in C: The Art of Scientific Computing, 1997. Cambridge University Press, Cambridge, UK. Available on-line at: http://www.nr.com/ 4. A. Lewis: Option Valuation under Stochastic Volatility, Finance Press, Newport Beach, California, 2000. *5.* A. Pelsser: Efficient Methods for Valuing Interest Rate Derivatives, Springer-Verlag, New York, 2000.	6. D. Ruppert, Statistics and Data Analysis for Financial Engineering, springer 2015. 7. R. Carmona: Statistical Analysis of Financial Data in S-Plus, springer 2014. 8. N. H. Chan, Time Series: Applications to Finance, Wiley, 2004. 9. R. S. Tsay, Analysis of Financial Time Series, 3rd edition, Wiley, 2010. *10.* J. Franke, W. K. Härdle and C. M. Hafner, Statistics of Financial Markets: An Introduction, springer 2011.

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	*40%*	-	*30%*	-	*30%*	-	*30%*	-	*30%*	-
	Understand										
Level 2	Apply	*40%*	-	*40%*	-	*40%*	-	*40%*	-	*40%*	-
	Analyze										
Level 3	Evaluate	*20%*	-	*30%*	-	*30%*	-	*30%*	-	*30%*	-
	Create										
	Total	100 %		100 %		100 %		100 %		-	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert Member from TCS		*1. Dr.Vinitha.K, SRMIST*

Course Code	18CSO163T	Course Name	Psychology	Course Category	O	Open Elective	L	T	P	C
							2	1	0	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Management	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	Understand the concept of industrial psychology			
CLR-2 :	Gain knowledge on the basics of recruitment and selection process			
CLR-3 :	Gain knowledge on performance appraisal methods and importance of performance reviews			
CLR-4 :	Learn the concept of motivation , its practical applications and diversity			
CLR-5 :	Know about leadership , organizational climate and culture			
CLR-6 :	Understand the various aspects of stress and mitigating stress			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	Acquire the knowledge on various aspects governing I/O psychology	2	80	85
CLO-2 :	Acquire the ability to identify right person fit for jobs and do reduce cost to company by bad hire	2	75	80
CLO-3 :	Explain the basic ideas on performance appraisal methods	2	85	80
CLO-4 :	Apply the knowledge about motivation in workplace and manage diverse workforce	2	80	75
CLO-5 :	Appreciate leadership styles, gain knowledge on organization climate and culture	2	75	85
CLO-6 :	Acquire the knowledge on stress management	2	80	85

		Program Learning Outcomes (PLO)														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Acquire the knowledge on various aspects governing I/O psychology	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-2 :	Acquire the ability to identify right person fit for jobs and do reduce cost to company by bad hire	H	H	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-3 :	Explain the basic ideas on performance appraisal methods	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-4 :	Apply the knowledge about motivation in workplace and manage diverse workforce	H	H	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-5 :	Appreciate leadership styles, gain knowledge on organization climate and culture	H	-	-	H	-	-	-	-	-	-	-	-	-	-	-
CLO-6 :	Acquire the knowledge on stress management	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Duration (hour)		9	9	9	9	9
S-1	SLO-1	*Introduction- I/O Psychology*	Identifying Criteria for recruitment	Performance Management-Introduction	Employee Motivation – Meaning, Concept	Leadership – Meaning, Styles
	SLO-2	*Definition , Scope of I/O Psychology*	Assessing the criteria	Performance Goals	Importance of Motivation	Theories of Leadership
S-2	SLO-1	Research Methods, Statistics	Selection Tests-Kinds	Importance of Performance Goal Setting	Early theories of Motivation	Organizational Climate -Meaning
	SLO-2	Evidence Based Practice	Validation of Tests	Methods of performance appraisal	Contemporary theories	Concept of Organization Climate
S-3	SLO-1	Industrial Psychology – Legal Context	Validating Measures	Merits and demerits of performance appraisal methods	Application of Motivation practices	Culture – Meaning , Types
	SLO-2	Job Analysis –Meaning, concept	Reliability of Tests	Past oriented Methods	Examples of corporates	Culture building
S-4	SLO-1	Competency Modeling -Meaning	Administering Tests	Future oriented methods	Employee Satisfaction	Culture and Development
	SLO-2	Methods of competency modeling	Collection of Responses	Performance Coaching	Employee Commitment	Weak and Strong cultures
S-5	SLO-1	Job Evaluation - Meaning	Screening Methods	Methods of coaching	Fairness in Employee Treatment	Teams in organizations
	SLO-2	Measurements	Relevance and importance of screening	Feedback on Performance	Concept of Fairness	Types of Teams
S-6	SLO-1	Compensation - Components	Selection process	Types of Feedback	Diversity -Meaning	Team Building
	SLO-2	Analytics	Interviews- Pros and Cons	Evaluating Performance	Importance of Diversity	Team Dynamics- Concept
S-7	SLO-1	*Job Design –Theory , Components*	Reference checks- Importance	*Importance of Performance Reviews*	*Issues in Diversity*	*Interventions in Team Development*
	SLO-2	*Employee Well -Being*	*Examples of references*	*Applications of Performance Measures*	*Overcoming challenges to Diversity*	*Organization of Work Behavior*

S-8	SLO-1	*Recruitment*	Intensive Methods	*Example formats of performance feedbacks*	*Strategies to manage diversity*	*Stress Management*
	SLO-2	*Definition and Relevance*	*Types of methods*	*Scope of performance management*	*Employee Equality*	Interventions
S-9	SLO-1	*Case study on Job Design*	*Types of Interviews*	*Case study on Performance Management*	*Case study on Diversity*	*Coping Mechanisms*
	SLO-2	*Discussion on case*	*Advantages and Disadvantages*	*Discussion*	*Discussion*	*Demands of Life and Work*

Learning Resources	1. *Landy, F.J. and Conte, J.M. (2013). Work in the 21st Century (4th Edition). Oxford: Blackwell Publishing* 2. *Paul E. Levy.(2020). Industrial/Organizational Psychology , Understanding the Workplace (6th Edition).Macmillan Publishing*

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	*40 %*	-	*30 %*	-	*30 %*	-	*30 %*	-	*30%*	-
Level 2	Apply Analyze	*40 %*	-	*40 %*	-	*40 %*	-	*40 %*	-	*40%*	-
Level 3	Evaluate Create	*20 %*	-	*30 %*	-	*30 %*	-	*30 %*	-	*30%*	-
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Expert member from TCS		**1. Dr. Priya Xavier, SRMIST**
		2. Dr. K. Santhanalakshmi, SRMIST

Course Code	18CSP461L	Course Name	Project Evaluation - 1 (To be undergone in the prescribed semester only as per the curriculum)	Course Category	P	Project Work, Seminar, Internship In Industry / Higher Technical Institutions (P)	L	T	P	C
							0	0	6	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	CSE	Data Book / Codes/Standards	As required for the project work		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
CLR-1 :	Learn responsible and professional way of working	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-2 :	Practice development-oriented approach to work			
CLR-3 :	Enhance students' knowledge in one particular technology			
CLR-4 :	Create awareness of the social, cultural, global and environmental responsibility as an engineer			
CLR-5 :	Grow more empathetic, become systems thinkers, become explorers, problem-solvers			
CLR-6 :	Learn project management.			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	Develop capability to acquire and apply fundamental principles of engineering	3	95	85
CLO-2 :	Become updated with all the latest changes in technological world	3	95	85
CLO-3 :	Make deep connections between ideas	3	95	85
CLO-4 :	Learn to take creative risks	3	95	85
CLO-5 :	Be ready for the creative economy also engage in iterative thinking and divergent thinking	3	95	85
CLO-6 :	Identify, formulate and model problems and find engineering solution based on a systems approach	3	95	85

Program Learning Outcomes (PLO)														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
H	M	M	H	H	H	L	H	H	H	H	H	-	-	-
H	M	M	H	H	H	L	H	H	H	H	H	-	-	-
H	M	M	H	H	H	L	H	H	H	H	H	-	-	-
H	M	M	H	H	H	L	H	H	H	H	H	-	-	-
H	M	M	H	H	H	L	H	H	H	H	H	-	-	-
H	M	M	H	H	H	L	H	H	H	H	H	-	-	-

Project Work Selection: Project Work Titles for students would be finalized by the Department Project Work Evaluation Committee

Learning Assessment	
Project Report (80% weightage)	*Final Presentation (20% weightage)*

Note: Final Presentation Evaluation would be done by the Department Project Work Evaluation Committee formed by the Department.

Course Code	18CSP462L	Course Name	Project Evaluation - 2 (To be undergone in the prescribed semester only as per the curriculum)	Course Category	P	Project Work, Seminar, Internship In Industry / Higher Technical Institutions (P)	L	T	P	C
							0	0	20	10

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	CSE	Data Book / Codes/Standards	As required for the project work		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	Learn responsible and professional way of working			
CLR-2 :	Practice development-oriented approach to work			
CLR-3 :	Enhance students' knowledge in one particular technology			
CLR-4 :	Create awareness of the social, cultural, global and environmental responsibility as an engineer			
CLR-5 :	Grow more empathetic, become systems thinkers, become explorers, problem-solvers			
CLR-6 :	Learn project management.			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	Develop capability to acquire and apply fundamental principles of engineering	3	95	85
CLO-2 :	Become updated with all the latest changes in technological world	3	95	85
CLO-3 :	Make deep connections between ideas	3	95	85
CLO-4 :	Learn to take creative risks	3	95	85
CLO-5 :	Be ready for the creative economy also engage in iterative thinking and divergent thinking	3	95	85
CLO-6 :	Identify, formulate and model problems and find engineering solution based on a systems approach	3	95	85

Program Learning Outcomes (PLO)														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
H	M	M	H	H	H	L	H	H	H	H	H	-	-	-
H	M	M	H	H	H	L	H	H	H	H	H	-	-	-
H	M	M	H	H	H	L	H	H	H	H	H	-	-	-
H	M	M	H	H	H	L	H	H	H	H	H	-	-	-
H	M	M	H	H	H	L	H	H	H	H	H	-	-	-
H	M	M	H	H	H	L	H	H	H	H	H	-	-	-

Project Work Selection: Project Work Titles for students would be finalized by the Department Project Work Evaluation Committee

Learning Assessment	
Project Report (80% weightage)	Final Presentation (20% weightage)

Note: Final Presentation Evaluation would be done by the Department Project Work Evaluation Committee formed by the Department.

Course Code	18CSP361L	Course Name	Mini Project - 1 (To be undergone in the prescribed semester only as per the curriculum)	Course Category	P	Project Work, Seminar, Internship In Industry / Higher Technical Institutions (P)	L	T	P	C
							0	0	2	1

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	CSE	Data Book / Codes/Standards	As required for the project work		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
CLR-1 :	Learn responsible and professional way of working	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-2 :	Practice development-oriented approach to work			
CLR-3 :	Enhance students' knowledge in one particular technology			
CLR-4 :	Create awareness of the social, cultural, global and environmental responsibility as an engineer			
CLR-5 :	Grow more empathetic, become systems thinkers, become explorers, problem-solvers			
CLR-6 :	Learn project management.			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	Develop capability to acquire and apply fundamental principles of engineering	3	95	85
CLO-2 :	Become updated with all the latest changes in technological world	3	95	85
CLO-3 :	Make deep connections between ideas	3	95	85
CLO-4 :	Learn to take creative risks	3	95	85
CLO-5 :	Be ready for the creative economy also engage in iterative thinking and divergent thinking	3	95	85
CLO-6 :	Identify, formulate and model problems and find engineering solution based on a systems approach	3	95	85

Program Learning Outcomes (PLO)														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
H	M	M	H	H	H	L	H	H	H	H	H	-	-	-
H	M	M	H	H	H	L	H	H	H	H	H	-	-	-
H	M	M	H	H	H	L	H	H	H	H	H	-	-	-
H	M	M	H	H	H	L	H	H	H	H	H	-	-	-
H	M	M	H	H	H	L	H	H	H	H	H	-	-	-
H	M	M	H	H	H	L	H	H	H	H	H	-	-	-

Project Work Selection: Project Work Titles for students would be finalized by the Department Project Work Evaluation Committee

Learning Assessment	
Project Report (80% weightage)	Final Presentation (20% weightage)

Note: Final Presentation Evaluation would be done by the Department Project Work Evaluation Committee formed by the Department.

Course Code	18CSM261L	Course Name	COMPETITIVE PROFESSIONAL SKILLS – I	Course Category	*M*	*Mandatory*	L	T	P	C
							0	0	2	0

Pre-requisite Courses	*Nil*	Co-requisite Courses	*Nil*	Progressive Courses	*Nil*
Course Offering Department	*Computer Science and Engineering*	Data Book / Codes/Standards	*Nil*		

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*
CLR-1 :	*Understand importance of mathematics and problem solving approaches for programming.*
CLR-2 :	*Understand importance of optimized solutions for problems solving and its relevance to industry.*
CLR-3 :	*Implement mathematical and logical understanding approaches to implement test driven development practices.*
CLR-4 :	*Start participating in global coding competitions relevant to the syllabus.*

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	Learning			Program Learning Outcomes (PLO)													
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	*Understand test and development aspects of programming by solving problems at Industry standards.*	*2*	*85*	*80*	*L*	*H*	*H*	*H*	*H*	-	-	*M*	*M*	*L*	-	*H*	-	-	-
CLO-2 :	*Interpret any given problem using required domain skills, mathematics.*	*3*	*85*	*80*	*L*	*H*	*H*	*H*	*H*	-	-	*M*	*M*	*L*	-	*H*	-	-	-
CLO-3 :	*Learn applicable methods to optimize solutions for any given problem.*	*3*	*85*	*80*	*L*	*H*	*H*	*H*	*H*	-	-	*M*	*M*	*L*	-	*H*	-	-	-
CLO-4 :	*Develop programs using C language until elementary data structures with test driven development.*	*3*	*85*	*80*	*L*	*H*	*H*	*H*	*H*	-	-	*M*	*M*	*L*	-	*H*	-	-	-

Duration (hour)		6	6	6	6	6
S-1	SLO-1	Introduction to coding, datatypes and I/O Statements, Expression Evaluation, Arithmetic Operations, Assignment Operations, Relational Operations, Logical Operations,	Introduction to Linear data, Subscript of an array, Representing the array data, Insert values into an array, Print the values of an array, print the values of an array in reverse, find an element in an array,	Introduction to Modular Programming, Function Terminology, Inter Function communication, call-by-value and call-by-reference,	Introduction to user defined data, structures, array within structure, array of structures,	Introduction to tuple, accessing tuples, tuple operations,
	SLO-2	Bitwise Operations, Ternary Operations, Increment Operations, Decrement Operations, Special Operators usage, Example Problems	Find the Max element in an array, Find the min element in an array, Print the sum of the elements of an array, Print the sum of positive elements of an array	passing an array, returning a pointer, Dangling pointing & Memory leak, Global Vs. Local data space, Storage classes	nested structures, structure padding, bit-fields, union, enumeration	introduction to dictionaries, accessing values in dictionaries, properties and functions
S-2	SLO-1	Lab 1:Coding on expression evaluations, understanding precedence and associativity	Lab 4:Basic list data problems, time efficient and classical problems on arrays.	Lab 7:Coding programs using functions	Lab 10:Coding problems including problems on implementation of user-defined data types	Lab 13:Coding problems implementing tuples
	SLO-2					
S-3	SLO-1	Control Structures, Branching, If statement, If-Else statement, Else-If Ladder, Nested If, Loops, While Statement, Nested while statement, do while statement,	Matrix Representation Introduction to 2D Array, 2D Array Subscript,	Introduction to Recursion, Recursive nature, Recursion evaluation methods,	Introduction to Python, Basic syntax, variables and data types, operators, Input and Output, conditional statements and loops.	Introduction to modules, importing modules, math module, random module,

Duration (hour)		6	6	6	6	6
	SLO-2	For statement, nested for statement, Switch-case statement, Branching Un-Conditional, goto statement, break statement, continue statement, return statement.	RMO & CMO Representation, Matrix Problems.	Head and Tail recursion, Iteration Vs Recursion	accessing strings, string operations, string slices, functions and methods,	packages and composition
S-4	SLO-1	Lab 2:Programs include coding for Control structure evaluations	Lab 5:Classical problems on matrix data, Matrix rotations, and display patterns	Lab 8: Coding programs using functions and recursions, finding factorial/Fibonacci series etc.	Lab 11: Problem solving on display patterns, series, strings and matrix using python	Lab 14:Problem solving implementing math and random modules and packages using python
	SLO-2					
S-5	SLO-1	Time Complexity Analysis Introduction to Time Complexities, Analyzing the code, Consecutive Statements, Conditional Statements.	Introduction to Pointers, Pointer Variable, Pointer Arithmetic, Pointer to an array, Pointer to a String, Memory Layout, Runtime memory allocation, Stack memory Vs Heap memory,	Recursion Analysis, forming a recurrence relation, Evaluating a recurrence relation,	Introduction to lists, accessing list,	Introduction to exceptions, exception handling, except clause,
	SLO-2	Loop Statements, Square root Complexities, Logarithmic Complexities, Exponential Complexities, Examples	Array Vs Pointer Array, Array Vs Pointer, Introduction to String Data, User defined string handling methods, String handling functions.	Time Analysis, Pseudocodes, Example exercises.	Working on Lists	try? finally clause, user defined exceptions
S-6	SLO-1	Lab 3:Coding for Generating Patterns, Number series	Lab 6:Coding problems on strings and pointer to strings	Lab 9: Coding problems on matrix data, strings using functions	Lab 12:Problems using Lists	Lab 15:Implementation of exception handling using python
	SLO-2					

Learning Resources	*1.* Problem solving with C++ -9e- Walter Savitch – Pearson, 2018 *2.* Programming in Python 3, A complete introduction to Python language - 2e - Mark Summerfield – Addison-Wiley, 2009 ***3.*** Guide to Competitive Programming: Learning and Improving Algorithms Through Contests by Antti Laaksonen - Springer; 1st ed. 2017 edition , 2018

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (100% weightage)								Final Examination	
		CLA – 1 (15%)		CLA – 2 (15%)		CLA – 3 (50%)		CLA – 4 (20%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	-	*40%*	-	*30%*	-	*30%*	-	*30%*	-	-
Level 2	Apply Analyze	-	*40%*	-	*40%*	-	*40%*	-	*40%*	-	-
Level 3	Evaluate Create	-	*20%*	-	*30%*	-	*30%*	-	*30%*	-	-
	Total	100 %		100 %		100 %		100 %		-	

CLA – 4 will be weekly Assignments

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Experts from Campus Corporate Connect		

Course Code	18CSM361L	Course Name	COMPETITIVE PROFESSIONAL SKILLS – II	Course Category	*M*	*Mandatory*	L	T	P	C
							0	0	2	0

Pre-requisite Courses	*Nil*	Co-requisite Courses	*Nil*	Progressive Courses	*Nil*
Course Offering Department	*Computer Science and Engineering*	Data Book / Codes/Standards	*Nil*		

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*
CLR-1 :	Understand importance of mathematics and problem solving approaches for programming.
CLR-2 :	Understand importance of optimized solutions for problems solving and its relevance to industry.
CLR-3 :	Implement mathematical and logical understanding approaches to implement test driven development practices.
CLR-4 :	Start participating in global coding competitions relevant to the syllabus.

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	Learning			Program Learning Outcomes (PLO)													
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Understand test and development aspects of programming by solving problems at Industry standards.	*2*	*85*	*80*	*L*	*H*	*H*	*H*	*H*	-	-	*M*	*M*	*L*	-	*H*	-	-	-
CLO-2 :	Interpret any given problem using required domain skills, mathematics.	*3*	*85*	*80*	*L*	*H*	*H*	*H*	*H*	-	-	*M*	*M*	*L*	-	*H*	-	-	-
CLO-3 :	Learn applicable methods to optimize solutions for any given problem.	*3*	*85*	*80*	*L*	*H*	*H*	*H*	*H*	-	-	*M*	*M*	*L*	-	*H*	-	-	-
CLO-4 :	Develop programs using C / any language with data structures.	*3*	*85*	*80*	*L*	*H*	*H*	*H*	*H*	-	-	*M*	*M*	*L*	-	*H*	-	-	-
CLO-5 :	Develop OOP programs through Java with test driven development,	*3*	*85*	*80*	*L*	*H*	*H*	*H*	*H*	-	-	*M*	*M*	*L*	-	*H*	-	-	-
CLO-6 :	Learn and implement database concepts required for placements.	*3*	*85*	*80*	*L*	*H*	*H*	*H*	*H*	-	-	*M*	*M*	*L*	-	*H*	-	-	-

Duration (hour)		6	6	6	6	6
S-1	SLO-1	Structure member reference, structure member pointer reference, formation of links, example codes,	Introduction to queues, queue operations.	Introduction to Non-linear data, tree structure and terminology, Tree structure formation. Types of trees,	Introduction to Red-Black Trees, Terminology, Formation of a Red-Black tree.	. Introduction to Templates, Exception handling, introduction to Standard Template Libraries,
	SLO-2	Introduction to Linked lists, creating a linked list, Insertion, deletion, search traversal operations on linked lists.	Queue implementation using array/ linked lists	Tree Traversals, Formation of a Binary tree, Classical tree algorithms.	Structure and operations on RBT.	Vectors, Maps, Pairs and Sets
S-2	SLO-1	Lab 1:Essential Coding problems on linked lists	Lab 4:Coding problems on queue implementation	Lab 7:Coding on Traversals, size, height of the tree structure and tree comparison etc	Lab 10:Problem solving using advanced tree structures. Practice problems on Binary Search Trees.	Lab 13:Programs implementing Object Oriented Programming concepts
	SLO-2					
S-3	SLO-1	Classical Coding problems on Linked Lists. Formation of a Circular linked list, Operations,	Search operations: linear/binary search.	Applying the search property on the binary tree, Operations on a Binary Search tree	Introduction to Trie Structure, Requirement of a Trie, multiple pointers in a node,	Introduction to DBMS, SQL Queries,
	SLO-2	Formation of a Double Linked List, Operations, Coding problems on Circular Linked list & Double linked lists.	Sorting algorithms: Basic sorting: O(n2) algorithms,	Probe Sequence, Balancing the search Tree	Trie structure formation, Insertion operations and pattern searching using Trie.	ER and Relational Models
S-4	SLO-1	Lab 2:Coding problems on Circular/Double linked lists	Lab 5:Programs include sorting the list data. Code for linear search and binary search.	Lab 8: Practice on essential coding and Binary Search Tree problems	Lab 11: Problem solving using Trie data structure	Lab 14:Practice on SQL Queries
	SLO-2					

S-5	SLO-1	Abstract Data Structures Introduction to Stacks function stack in the memory, stack operations.	Classical sorting: Quick Sort, Merge Sort,	Introduction to Multi-way search structures, Memory allocation for dynamic structures,	Introduction to Object Oriented Programming, Features of OOP, Classes and Objects,	Data Definition and Query Optimization, Transactions and Concurrency,
	SLO-2	Stack implementation using array/linked lists.	Introduction to combinational sorting, O (n log n) algorithms	2-4 trees, 2-4 tree insertions, split and promote in insertions, deletions in a 2-4 tree, deletions by rotation, deletions by merging	Method Overloading and type conversions, Polymorphism and virtual functions	Normalization, case studies
S-6	SLO-1	Lab 3:Coding problems on stack implementation	Lab 6:Programs for Quick sort and Merge sort.	Lab 9: Practice on memory allocation for dynamic structures	Lab 12:Programs implementing Object Oriented Programming concepts	Lab 15:Essential practice on DBMS for Tests & Interviews
	SLO-2					

Learning Resources	1. Guide to Competitive Programming: Learning and Improving Algorithms Through Contests by Antti Laaksonen - Springer; 1st ed. 2017 edition ,2018 2. Steven Halim and Felix Halim, Competitive Programming, 3rd Edition, lulu; Third Edition edition ,2013 3. C++ Standard Library A Tutorial and Reference – 2e - Nicolai M. Josuttis - Addison Wesley Longman, 2012	4. Fundamentals of Data Structures in C++ - 2e- Sahni Horowitz - Universities Press, 2008 5. Sartaj Sahni, Data Structures, Algorithms, and Applications in Java Silicon Press, 2004 6. An Introduction to Database Systems – 8e - C.J. Date – Pearson, 2006

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (100% weightage)								Final Examination	
		CLA – 1 (15%)		CLA – 2 (15%)		CLA – 3 (50%)		CLA – 4 (20%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	-	*40%*	-	*30%*	-	*30%*	-	*30%*	-	-
	Understand										
Level 2	Apply	-	*40%*	-	*40%*	-	*40%*	-	*40%*	-	-
	Analyze										
Level 3	Evaluate	-	*20%*	-	*30%*	-	*30%*	-	*30%*	-	-
	Create										
	Total	100 %		100 %		100 %		100 %		-	

CLA – 4 will be weekly Assignments

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Experts from Campus Corporate Connect		

Course Code	18CSM362L	Course Name	COMPETITIVE PROFESSIONAL SKILLS – III	Course Category	*M*	*Mandatory*	L	T	P	C
							0	0	2	0

Pre-requisite Courses	*Nil*	Co-requisite Courses	*Nil*	Progressive Courses	*Nil*
Course Offering Department	*Computer Science and Engineering*	Data Book / Codes/Standards	*Nil*		

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*	Learning		
		1	2	3
CLR-1 :	Understand importance of mathematics and problem solving approaches for programming.			
CLR-2 :	Understand importance of optimized solutions for problems solving and its relevance to industry.			
CLR-3 :	Implement mathematical and logical understanding approaches to implement test driven development practices.			
CLR-4 :	Start participating in global coding competitions relevant to the syllabus.			

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Program Learning Outcomes (PLO)														
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
					Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Understand test and development aspects of programming by solving problems at Industry standards.	*2*	*85*	*80*	*L*	*H*	*H*	*H*	*H*	-	-	*M*	*M*	*L*	-	*H*	-	-	-
CLO-2 :	Interpret statistical problems using required domain skills, mathematics.	*3*	*85*	*80*	*L*	*H*	*H*	*H*	*H*	-	-	*M*	*M*	*L*	-	*H*	-	-	-
CLO-3 :	Learn applicable methods to optimize solutions for any given problem.	*3*	*85*	*80*	*L*	*H*	*H*	*H*	*H*	-	-	*M*	*M*	*L*	-	*H*	-	-	-
CLO-4 :	Develop programs using C, python / any preferred language until advanced algorithms with test driven development approach.	*3*	*85*	*80*	*L*	*H*	*H*	*H*	*H*	-	-	*M*	*M*	*L*	-	*H*	-	-	-
CLO-5 :	Implement problem solving using R programming	*3*	*85*	*80*	*L*	*H*	*H*	*H*	*H*	-	-	*M*	*M*	*L*	-	*H*	-	-	-

Duration (hour)		6	6	6	6	6
S-1	SLO-1	Descriptive Statistics Introduction, Measures of central tendency, Mean, Median, Mode,	Introduction to Graph Coloring, Introduction to DAG, Graph Check, DFS Spanning Tree,	Introduction to Activity Selection problem, Job sequencing problems with deadlines,	Dynamic Knapsack, Significance of the substructure, ways to decode,	Introduction to Backtracking, Differences between backtracking and brute force methods, State space diagram,
	SLO-2	Measures of dispersion, range, variance, standard deviation, quartile deviation.	Articulation Points and Bridges, Strongly Connected points	Spanning trees,	DP coin-change formation of sub structure.	N Queens problem, finding a way, Solving Grid based backtracking problems
S-2	SLO-1	Lab 1:Practice on Statistics, mean median, mode problems	Lab 4:Coding problems on graphs	Lab 7:Problems on Job sequencing	Lab 10:problem solving applying Dynamic programming strategies	Lab 13:Programming on backtracking implementing iterative and loop free approaches
	SLO-2					
S-3	SLO-1	Essential Statistics for data science Moments, Random variable: discrete, continuous, expected value of random variable, PMF, PDF, CDF,	Introduction to Algorithms, Greedy Strategy, Selection sort as a greedy technique,	MSTs: Prim's Algorithm, Kruskal's Algorithm,	Classical Problem solving: Longest Common Sub-String, Longest Common Sub-sequence, Minimum Edit Distance,	Introduction to programming in R Basic programming constructs, Calculations, Datatypes, variables, operators,
	SLO-2	univariate random variable, Bi variate random variable. Covariance, correlation, regression.	coin change problems,	Dijkstra's Algorithm	Longest Increasing sub-sequence, min path matrix, Max Sum Square & Matrix Problems	vectors, lists
S-4	SLO-1	Lab 2:Practice on Sums and Integer Functions	Lab 5:Coding Problems on Huffman coding	Lab 8: Problems on MST	Lab 11: Solutions to Classical grid problems of Dynamic programming	Lab 14:Coding implementing R programming
	SLO-2					
S-5	SLO-1	Introduction to Graph Terminology, Handshaking Lemma, Checking Degree sequence	Fractional Knapsack,	Introduction to Dynamic programming strategies, Problem statement, Memoization, ,	Introduction to Divide and Conquer approach, Relating the D and C approach to problems, Fast matrix multiplication method,	Programming in R using matrices Matrices and Data frame,

Duration (hour)		6	6	6	6	6
	SLO-2	, DFS, BFS, Connected Components, Colorings	Example problems	Optimal Substructure formation, P and NP Problem description	Quick and Merge Sort as D and C Approaches. Min function, Power function problem solving through D and C approach.	Conditional Statements and loops, exercises
S-6	SLO-1	Lab 3:Coding problems on graphs	Lab 6:Coding Problems on Greedy Methods	Lab 9: problem solving applying Dynamic programming strategies	Lab 12:Solutions to problems on Divide and Conquer approach	Lab 15:Problem solving using R programming
	SLO-2					

Learning Resources	
1. Guide to Competitive Programming: Learning and Improving Algorithms Through Contests by Antti Laaksonen - Springer; 1st ed. 2017 edition , 2018 *2.* Steven Halim and Felix Halim, Competitive Programming, 3rd Edition, lulu; Third Edition edition ,2013 *3.* Thomas H. Coremen et al., Introduction to Algorithms, MIT ,3rd Edition, ISBN-13: 978-0262533058 &ISBN-10: 0262533057,2009 *4.* Sartaj Sahni, Data Structures, Algorithms, and Applications in C++, Silicon Press, 2004	*5.* An Introduction to Statistical Learning: with Applications in R - Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, 2017 *6.* Introduction to Algorithms by Thomas H. Corman, The MIT Press, 3rd Edition, 2009 *7.* Introduction to Algorithms: A Creative Approach by Udi Mander, Pearson,1998 *8.* R Cookbook - Paul Teetor, O'reilly, 2011

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	Create										
	Total	100 %		100 %		100 %		100 %		-	

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