B.Tech. in Computer Science and Engineering
with Specialization in Big Data Analytics

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*

Program Educational Objectives (PEO)

PEO - 1	*Graduates will be able to perform in technical/managerial roles ranging from design, development, problem solving to production support in software industries and R&D sectors.*
PEO - 2	*Graduates will be able to successfully pursue higher education in reputed institutions.*
PEO - 3	*Graduates will have the ability to adapt, contribute and innovate new technologies and systems in the key domains of Computer Science and Engineering.*
PEO - 4	*Graduates will be ethically and socially responsible solution providers and entrepreneurs in Computer Science and other engineering disciplines.*
PEO - 5	*Graduates will possess the additional skills in handling Big Data using the state-of-art tools and techniques*
PEO - 6	*Graduates will be able to apply the principles of data science for providing real world business solutions*

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	*M*	*H*	*H*	*H*	*H*
PEO - 6	*M*	*H*	*H*	*H*	*H*

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

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*	*L*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*H*
PEO - 6	*H*	*H*	*L*	*H*	*H*	*H*	*H*	*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 Utilize Data Science Principles*
PSO - 2	*Ability to Analyze Data, Software & Programming*
PSO - 3	*Analysis and Interpretation of data*

Program Structure:B.Tech. in Computer Science and Engineering with Specialization in Big Data Analytics

1. Humanities & Social Sciences including Management Courses (H)

Course Code	Course Title	Hours/ Week L	T	P	C
18LEH101J	English	2	0	2	3
18LEH102J	Chinese				
18LEH103J	French				
18LEH104J	German	2	0	2	3
18LEH105J	Japanese				
18LEH106J	Korean				
18PDH101T	General Aptitude	0	0	2	1
18PDH102T	Management Principles for Engineers	2	0	0	2
18PDH103T	Social Engineering	2	0	0	2
18PDH201T	Employability Skills & Practices	0	0	2	1
	Total Learning Credits				**12**

2. Basic Science Courses (B)

Course Code	Course Title	Hours/ Week L	T	P	C
18PYB103J	Physics: Semiconductor Physics	3	1	2	5
18CYB101J	Chemistry	3	1	2	5
18MAB101T	Calculus and Linear Algebra	3	1	0	4
18MAB102T	Advanced Calculus and Complex Analysis	3	1	0	4
18MAB201T	Transforms and Boundary Value Problems	3	1	0	4
18MAB204T	Probability and Queueing Theory	3	1	0	4
18MAB302T	Discrete Mathematics for Engineers	3	1	0	4
18BTB101T	Biology	2	0	0	2
	Total Learning Credits				**32**

3. Engineering Science Courses (S)

Course Code	Course Title	Hours/ Week L	T	P	C
18MES101L	Engineering Graphics and Design	1	0	4	3
18EES101J	Basic Electrical and Electronics Engineering	3	1	2	5
18MES103L	Civil and Mechanical Engineering Workshop	1	0	4	3
18CSS101J	Programming for Problem Solving	3	0	4	5
18CSS201J	Analog and Digital Electronics	3	0	2	4
18CSS202J	Computer Communications	2	0	2	3
	Total Learning Credits				**23**

4. Professional Core Courses (C)

Course Code	Course Title	Hours/ Week L	T	P	C
18CSC201J	Data Structures and Algorithms	3	0	2	4
18CSC202J	Object Oriented Design and Programming	3	0	2	4
18CSC203J	Computer Organization and Architecture	3	0	2	4
18CSC204J	Design and Analysis of Algorithms	3	0	2	4
18CSC205J	Operating Systems	3	0	2	4
18CSC206J	Software Engineering and Project Management	3	0	2	4
18CSC207J	Advanced Programming Practice	3	0	2	4
18CSC301T	Formal Language and Automata	3	0	0	3
18CSC302J	Computer Networks	3	0	2	4
18CSC303J	Database Management Systems	3	0	2	4
18CSC304J	Compiler Design	3	0	2	4
18CSC305J	Artificial Intelligence	3	0	2	4
18CSC350T	Comprehension	0	1	0	1
	Total Learning Credits				**48**

5. Professional Elective Courses (E)

(Any 6 Elective Courses)

Course Code	Course Title	Hours/ Week L	T	P	C
18CSE391T	Big Data Tools and Techniques	3	0	0	3
18CSE355T	Data Mining and Analytics	3	0	0	3
18CSE392T	Machine Learning - I	3	0	0	3
18CSE360T	Information Storage and Management	3	0	0	3
18CSE393T	Text Mining	3	0	0	3
18CSE394T	Business Intelligence and Analytics	3	0	0	3
18CSE395T	Web Intelligence	3	0	0	3
18CSE396T	Data Science	3	0	0	3
18CSE455T	Database Security and Privacy	3	0	0	3
18CSE487T	Data Warehousing and its Applications	3	0	0	3
18CSE488T	Functional Programming	3	0	0	3
18CSE489T	Streaming Analytics	3	0	0	3
18CSE490T	Big Data Visualization	3	0	0	3
18CSE484T	Deep Learning	3	0	0	3
18CSE491T	Machine Learning – II	3	0	0	3
	Total Learning Credits				**18**

6. Open Elective Courses (O)

Course Code	Course Title	Hours/ Week L	T	P	C
18CSO101T	IT Infrastructure Management	3	0	0	3
18CSO102T	Mobile Application Development	3	0	0	3
18CSO103T	System Modeling and Simulation	3	0	0	3
18CSO104T	Free and Open Source Softwares	3	0	0	3
18CSO105T	Android Development	3	0	0	3
18CSO106T	Data Analysis using Open Source Tools	3	0	0	3
18CSO107T	IOS Development	3	0	0	3
	Total Learning Credits				**12**

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
18PDM203L	Entrepreneurial Skill Development				

7. Project Work, Seminar, Internship In Industry/ Higher Technical Institutions (P)

Course Code	Course Title	Hours/ Week L	T	P	C
18CSP101L	MOOC / Industrial Training / Seminar - 1	0	0	2	1
18CSP102L	MOOC / Industrial Training / Seminar - 2	0	0	2	1
18CSP103L	Project (Phase-I) / Internship (4-6 weeks)	0	0	6	3
18CSP104L	Project (Phase-II) / Semester Internship	0	0	20	10
	Total Learning Credits				**15**

18PDM202L	Critical and Creative Thinking Skills	0	0	2	0
18PDM204L	Business Basics for Entrepreneurs				
18PDM301L	Analytical and Logical Thinking Skills	0	0	2	0
19PDM302L	Entrepreneurship Management				
18LEM101T	Constitution of India	1	0	0	0
18LEM102J	Value Education	1	0	1	0
18GNM101L	Physical and Mental Health using Yoga	0	0	2	0

8. Mandatory Courses (M)

Course Code	Course Title	Hours/ Week L	T	P	C
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

Program Articulation:B.Tech. in Computer Science and Engineering with Specialization in Big Data Analytics

Course Code	Course Name	Program Learning Outcomes (PLO)													
		Graduate Attributes											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
18CSS101J	Programming for Problem Solving	H	H	M	M	H	L	L	M	H	M	L	H	L	H	H
18CSC201J	Data Structures and Algorithms	H	H	H	H	M	L	L	M	H	M	M	H	L	H	H
18CSC202J	Object Oriented Design and Programming	H	H	H	H	H	M	L	M	H	H	M	H	L	H	H
18CSC203J	Computer Organization and Architecture	H	M	H	M	L	L	L	M	L	L	L	M	H	M	M
18CSC204J	Design and Analysis of Algorithms	H	H	H	H	M	M	L	M	M	M	M	H	L	H	H
18CSC205J	Operating Systems	H	H	H	H	H	M	L	M	H	M	M	H	H	H	M
18CSC206J	Software Engineering and Project Management	H	H	H	H	H	H	H	H	H	H	H	H	L	H	M
18CSC207J	Advanced Programming Practice	H	H	M	M	H	L	L	M	H	M	L	H	L	H	H
18CSC301T	Formal Language and Automata	H	H	H	H	L	L	L	L	M	M	L	H	H	H	H
18CSC302J	Computer Networks	H	H	H	H	H	M	L	M	H	M	M	H	H	H	M
18CSC303J	Database Management Systems	H	H	H	H	H	M	L	M	H	M	M	H	H	H	M
18CSC304J	Compiler Design	H	H	H	H	M	L	L	L	M	M	L	H	H	H	H
18CSC305J	Artificial Intelligence	H	H	H	H	M	M	L	L	M	M	L	H	H	H	H
18CSE391T	Big Data Tools and Techniques	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
18CSE355T	Data Mining and Analytics	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
18CSE392T	Machine Learning - I	H	H	H	H	H	H	H	M	H	H	M	H	H	H	H
18CSE360T	Information Storage and Management	H	H	H	H	M	H	H	M	H	M	H	H	H	M	H
18CSE393T	Text Mining	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
18CSE394T	Business Intelligence and Analytics	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
18CSE395T	Web Intelligence	H	H	H	H	H	H	H	H	H	H	M	H	H	H	H
18CSE396T	Data Science	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
18CSE455T	Database Security and Privacy	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
18CSE487T	Data Warehousing and its Applications	H	H	M	H	H	H	H	M	H	M	H	H	H	M	H
18CSE488T	Functional Programming	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
18CSE489T	Streaming Analytics	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
18CSE490T	Big Data Visualization	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
18CSE484T	Deep Learning	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
18CSE491T	Machine Learning – II	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
18CSP101L	MOOC / Industrial Training / Seminar - 1	H	M	M	M	M	M	M	M	H	H	H	M	H	H	H
18CSP102L	MOOC / Industrial Training / Seminar - 2	H	M	M	M	M	M	M	M	H	H	H	M	H	H	H
18CSP103L	Project (Phase-I) / Internship (4-6 weeks)	H	H	H	H	H	M	M	H	H	H	H	H	H	M	M
18CSP104L	Project (Phase-II) / Semester Internship	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

Implementation Plan:B.Tech. in Computer Science and Engineering with Specialization in Big Data Analytics

Semester - I

Code	Course Title	Hours/ Week L	T	P	C
18LEH101J	English	2	0	2	3
18MAB101T	Calculus and Linear Algebra	3	1	0	4
18PYB103J	Physics: Semiconductor Physics	3	1	2	5
18MES101L	Engineering Graphics and Design	1	0	4	3
18EES101J	Basic Electrical and Electronics Engineering	3	1	2	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

Semester - II

Code	Course Title	Hours/ Week L	T	P	C
18LEH10XJ	Chinese / French / German / Japanese/ Korean	2	0	2	3
18MAB102T	Advanced Calculus and Complex Analysis	3	1	0	4
18CYB101J	Chemistry	3	1	2	5
18CSS101J	Programming for Problem Solving	3	0	4	5
18MES103L	Civil and Mechanical Engineering Workshop	1	0	4	3
18PDH101T	General Aptitude	0	0	2	1
18LEM102J	Value Education	1	0	1	0
18GNM10XL	NCC / NSS / NSO	0	0	2	0
	Total Learning Credits				21

Semester - III

Code	Course Title	Hours/ Week L	T	P	C
18MAB201T	Transforms and Boundary Value Problems	3	1	0	4
18BTB101T	Biology	2	0	0	2
18CSS201J	Analog and Digital Electronics	3	0	2	4
18CSC201J	Data Structures and Algorithms	3	0	2	4
18CSC202J	Object Oriented Design and Programming	3	0	2	4
18CSC203J	Computer Organization and Architecture	3	0	2	4
18PDH102T	Management Principles for Engineers	2	0	0	2
18PDM201L	Competencies in Social Skills	0	0	2	0
18PDM203L	Entrepreneurial Skill Development				
	Total Learning Credits				24

Semester - IV

Code	Course Title	Hours/ Week L	T	P	C
18MAB204T	Probability and Queueing Theory	3	1	0	4
18CSS202J	Computer Communications	2	0	2	3
18CSC204J	Design and Analysis of Algorithms	3	0	2	4
18CSC205J	Operating Systems	3	0	2	4
18CSC206J	Software Engineering and Project Management	3	0	2	4
18CSC207J	Advanced Programming Practice	3	0	2	4
18PDH103T	Social Engineering	2	0	0	2
18PDM202L	Critical and Creative Thinking Skills	0	0	2	0
18PDM204L	Business Basics for Entrepreneurs				
18CYM101T	Environmental Science	1	0	0	0
	Total Learning Credits				25

Semester - V

Code	Course Title	Hours/ Week L	T	P	C
18MAB302T	Discrete Mathematics for Engineers	3	1	0	4
18CSC301T	Formal Language and Automata	3	0	0	3
18CSC302J	Computer Networks	3	0	2	4
	Professional Elective – 1	3	0	0	3
	Professional Elective – 2	3	0	0	3
	Open Elective – 1	3	0	0	3
	Open Elective – 2	3	0	0	3
18CSP101L	MOOC / Industrial Training / Seminar - 1	0	0	2	1
18PDM301L	Analytical and Logical Thinking Skills	0	0	2	0
19PDM302L	Entrepreneurship Management				
18LEM109T	Indian Traditional Knowledge	1	0	0	0
	Total Learning Credits				24

Semester - VI

Code	Course Title	Hours/ Week L	T	P	C
18CSC303J	Database Management Systems	3	0	2	4
18CSC304J	Compiler Design	3	0	2	4
18CSC305J	Artificial Intelligence	3	0	2	4
18CSC350T	Comprehension	0	1	0	1
	Professional Elective – 3	3	0	0	3
	Professional Elective – 4	3	0	0	3
	Open Elective – 3	3	0	0	3
18CSP102L	MOOC / Industrial Training / Seminar - 2	0	0	2	1
18PDH201T	Employability Skills and Practices	0	0	2	1
18LEM110L	Indian Art Form	0	0	2	0
	Total Learning Credits				24

Semester - VII

Code	Course Title	Hours/ Week L	T	P	C
	Professional Elective – 5	3	0	0	3
	Professional Elective – 6	3	0	0	3
	Open Elective – 4	3	0	0	3
18CSP103L	Project (Phase-I) / Internship (4-6 weeks)	0	0	6	3
	Total Learning Credits				12

Semester - VIII

Code	Course Title	Hours/ Week L	T	P	C
18CSP104L	Project (Phase-II) / Semester Internship	0	0	20	10
	Total Learning Credits				10

BTECH (CSE)
SPECIALIZATION IN BIG DATA ANALYTICS

SYLLABUS - SEMESTER I TO VIII

Course Code	18LEH101J	Course Name	ENGLISH	Course Category	H	Humanities and Social Sciences including Management	L	T	P	C
							2	0	2	3

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		Program Learning Outcomes (PLO)

			1	2	3		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	*Analyze the importance of communication in personal, professional contexts. Identify proper English pronunciation*		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 :	*Strengthen vocabulary and grammar. Enhance listening and writing comprehension. Review films and documentaries*																				
CLR-3 :	*Writing brief paragraphs using appropriate techniques. Enhance their English fluency in speaking*																				
CLR-4 :	*Write effective essays, stories. Experience workplace communication aspects*																				
CLR-5 :	*Research on a topic and write a comprehensible academic project reports. Make effective presentations*																				
CLR-6 :	*Utilize English language skills along with technical skills in build wider career orientations*																				
Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*																				
CLO-1 :	*Identify types, modes, channels and barriers of communication.distinguish different speech sounds, pronounce correctly*		*1*	*70*	*60*		*L*	*H*	*L*	*H*	*H*	*H*	*L*	*H*	*H*	*H*	-	*H*	-	-	-
CLO-2 :	*Identify, rectify the errors in the use of grammar and vocabulary. Improve listening and writing skills*		*2*	*65*	*60*		*L*	*H*	*L*	*H*	*H*	*H*	*L*	*H*	*H*	*H*	-	*H*	-	-	-
CLO-3 :	*Develop a topic idea into a cohesive paragraph with examples. Improve the fluency of speaking skills*		*3*	*75*	*70*		*L*	*H*	*L*	*H*	*H*	*M*	*L*	*H*	*H*	*H*	-	*H*	-	-	-
CLO-4 :	*Develop ideas into logical and coherent essays. Understand better the workplace culture*		*3*	*75*	*65*		*L*	*H*	*L*	*H*	*H*	*H*	*L*	*H*	*H*	*H*	-	*H*	-	-	-
CLO-5 :	*Identify the steps involved in writing an academic project report. List and practice skills need for making a presentation*		*3*	*75*	*65*		*L*	*H*	*L*	*H*	*H*	*H*	*L*	*H*	*H*	*H*	-	*H*	-	-	-
CLO-6 :	*Build listening, speaking, reading, writing abilities in English, To interact with English speaking people.*		*3*	*70*	*65*		*L*	*L*	*L*	*H*	*H*	*H*	*L*	*H*	*H*	*H*	-	*H*	-	-	-

		Communication	*Vocabulary and Grammar*	*Discourse Techniques*	*Workplace Communication*	*Project Writing*
Duration (hour)		12	12	12	12	12
S-1	SLO-1	*Definition, process of communication*	*Words with Foreign roots, Word formation – inflectional, derivational prefixes, suffixes*	*Sentence structure, Phrases and Clauses*	*Reading Comprehension, Guidelines questions (referential,critical,interpretative)*	*Topics for project writing*
	SLO-2	*Filling in-class worksheets*	*Quiz - Identifying the borrowed roots and their meanings-Worksheet exercise*	*Exercise:worksheet, Identifying phrases, clauses, compound, complex sentences*	*Practice Exercise*	*Discussion*
S-2	SLO-1	*Verbal and non-verbal communication*	*Synonyms and Antonyms and Standard abbreviations*	*Developing ideas into paragraphs – cohesion markers*	*Précis-writing Guidelines*	*Collection of Data – avoiding plagiarism-authenticity and credibility of data*
	SLO-2	*Individual and group activities - Role play*	*Context based activity / Learner compiling standard abbreviations from core subject*	*Identify topic sentence in a paragraph; writing a paragraph based on a topic*	*Practice Exercise*	*Collection of data for verification*
S-3	SLO-1	*LAB: Individual speech sounds*	*LAB: Listening to long conversations*	*LAB: Listening to short stories - Science fiction*	*LAB: Videos on workplace scenario Open Discussion on Workplace Etiquette*	*LAB: Importance of availing credible resources with examples*
	SLO-2	*Courseware on speech sounds (Listening and reproducing)*	*Identify communication contexts, use of making a word list in relation to the context*	*Identify main idea of the given story and narrate a story on the given topic – Written*	*speaking language known to everyone, space, polite words, actions, objective*	*Collecting and compiling resource materials*
S-4	SLO-1	*LAB: often mispronounced sounds*	*LAB: Listening to long conversations, daily life*	*LAB: Speaking - practice activity – brain storming – mind mapping*	*LAB: Videos on workplace communication*	*LAB: Guidelines for preparing a PPT; presentation techniques*
	SLO-2	*Audio visual material (Listening to minimal pairs and reproducing)*	*Identify various communication contexts and answering questions - collocation*	*Just a Minute*	*Role play based on the given workplace contexts*	*Preparing PPT on the topic of learners' choice*

S-5	SLO-1	*Other Types of Communication: general technical-formal, informal-external, internal*	*Homonyms and Homophones*	*Inputs on writing precisely, redundancies, wordiness-repetition-clichés*	*Summarising*	*Guidelines for writing: outline-objectives-background- methodology-discussion*
	SLO-2	*Write upon a selected type of communication*	*Fun activities – worksheets- cross words*	*Error analysis and editing*	*Group activity (oral/written) on the given passages*	*Drafting an outline*
S-6	SLO-1	*Listening, Speaking, Reading, Writing*	*Articles, Tenses*	*Defining, describing technical terms*	*Essay Writing, general introduction*	*Discussion using sample project*
	SLO-2	*Group activity (Newspaper) – Discussion and Feedback*	*Exercise through worksheets- individual activity -peer correction- open discussion*	*Writing definitions-product and process description*	*Brainstorming on relevant technical and non-technical topics*	*Writing the first draft on the selected topic*
S-7	SLO-1	*LAB: Material on mispronounced words*	*LAB: Watching documentaries & short films related to science and technology*	*LAB: Describing a scene or event - videos*	*LAB: Technical communication – Interpreting Data*	*Giving inputs on documentation based on IEEE*
	SLO-2	*Individual oral activity and rectification of the probable mistakes.*	*Picking out the terminology related to science and technology*	*String narration – describing an event or a scene*	*Group activity - interpretation of data - oral presentation*	*Preparing references*
S-8	SLO-1	*LAB: sentence types*	*LAB: Introduction to English es –British and American -Videos*	*LAB: Channels of communication - videos*	*LAB: External Communication-Advertising*	*Checklist for project format (PPT)*
	SLO-2	*Practice on sentence stress and intonation*	*Discussion on difference between British and American words*	*Observing and identifying the channels of communication –Role play*	*ADZAP (promoting a product) - Oral*	*Self-verification and submission of final draft*
S-9	SLO-1	*Communication barriers*	*Noun-pronoun agreement and subject-verb agreement*	*Inputs on Classifying/categorising and sequencing ideas with relevant diagrams*	*Essay Writing Guidelines: introduction, elaboration and conclusion with examples*	*LAB: Formal Presentation*
	SLO-2	*Individual activity- sharing of personal experiences*	*Identifying and learning through error analysis - worksheets*	*Writing a passage on the given hints, tree diagram, classification table and flow chart*	*Individual activity (Written) on the given topic*	*LAB: Formal Presentation*
S-10	SLO-1	*Organizational communication - Channels of communication*	*Misplaced modifiers - prepositions-prepositional verbs and phrasal verbs*	*Importance of punctuation – miscommunication –errors in punctuation*	*Organisational Report Writing - Progress report- Guidelines*	*LAB: Formal Presentation*
	SLO-2	*Group activity (worksheet) with visuals or written material.*	*Learn through practice – placing same modifier in different places in a sentence*	*Fun activities - worksheets for appropriate punctuation - written*	*Writing a progress report*	*LAB: Formal Presentation*
S-11	SLO-1	*LAB: short biographical account on famous personalities -video*	*LAB: Watching video based on daily life*	*LAB: Barriers of communication Language barriers - videos*	*LAB: Sample case studies for work ethics - videos*	*LAB: Formal Presentation*
	SLO-2	*Oral paraphrasing of the content shown*	*Observing and recording the features of spoken English*	*Identifying the language barriers of communication –Written*	*Debate on the videos shown*	*LAB: Formal Presentation*
S-12	SLO-1	*LAB: Listening to short conversations*	*LAB: Watching interviews of famous personalities*	*LAB: Barriers of communication-personal and organizational - video*	*LAB: Learning interview techniques through models*	*LAB: Formal Presentation*
	SLO-2	*Answering the questions on the above content*	*Quiz on the video shown*	*Role play on the videos shown*	*Mock interview*	*LAB: Formal Presentation*

Learning Resources	*1. Swan, Michael. Practical English Usage. OUP, 1995* *2. Kumar Sanjay and Pushpa Lata. Communication Skills. OUP, 2011*	*3. CIEFL, Hyderabad. Exercises in Spoken English. Parts I-III. OUP* *4. Anbazhagan K, Cauveri B, Devika M.P., English for Engineers. Cengage, 2016*	*5. www.mmm.english.com* *6. www.usingenglish.com*	*7. www.onlinewriting.com/purdue* *8. www.ieee.org/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		
1. Dr. Usha Kodandaraman, ABK AOTS, Chennai .	*1 .Dr. S. P.Dhanavel, IITM, Chennai,*	*1. Dr. K. Anbazhagan,*	*3. Dr.Sukanya Saha, SRMIST*	*5. S. Ramya,*

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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	18LEH102J	Course Name	CHINESE	Course Category	H	Humanities and Social Sciences including Management	L	T	P	C
							2	0	2	3

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	Program Learning Outcomes (PLO)

			Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)		Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design,	Modern Tool Usage	Society & Culture	Environment &	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
			1	2	3		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Pronounce Chinese Romanization,know about China and Chinese speaking countries, Read basic Chinese characters																				
CLR-2 :	Help ask about the need, counting numbers, Greet each other, express time and date in daily conversations																				
CLR-3 :	Ask about directions, learn basic conversation on orientation																				
CLR-4 :	Daily activities and asking about places and Chinese etiquette																				
CLR-5 :	List the Chinese festivals and Chinese culture, acquire basic conversational skills																				
CLR-6 :	Utilize Chinese language skills along with technical skills in build wider career orientations																				
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																				
CLO-1 :	Pronounce Chinese language, Identify the basic Chinese scripts, tones and greetings		1	60	60		-	-	M	-	M	H	L	M	H	L	-	H	-	-	-
CLO-2 :	Identify basic grammar,count numbers, tell date and time, makeinterrogative sentences and basic conversations		2	65	62		-	-	H	-	H	M	L	M	H	M	-	H	-	-	-
CLO-3 :	Ask different kinds of questions, to tell age using Chinese words		2	68	63		-	-	M	-	M	L	L	M	L	M	-	H	-	-	-
CLO-4 :	Identify the different usage of Chinese grammar and vocabulary and introduce one self		2	69	65		-	-	H	-	H	H	L	M	H	H	-	H	-	-	-
CLO-5 :	Appropriately use different verbs and adjectives in basic conversations		2	72	63		-	-	H	-	H	H	L	M	M	H	-	H	-	-	-
CLO-6 :	Build listening, speaking, reading, writing abilities in Chinese, To interact with Chinese people and understand their culture		2	70	60		-	-	H	-	H	H	L	M	H	H	-	H	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	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 frequently used construction in Chinese.
	SLO-2	Introduction of initials, finals in Mandarin	Counting numbers and numeric system	Nationality	Conversation to make suggestion, accept of dealing suggestion, make comments.	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 Chinese currency.	Direction in Chinese.	Sentence with nominal predicate, Subject verb construction as its predicate.	Famous Chinese festivals
	SLO-2	Basic greetings, Phrases used in daily life (in pinyin)	Converse to greet others, express needs	Making question with 几,多少	Fruit related vocabulary, application.	Major Chinese cities
S-3	SLO-1	Tables of combination of initials and finals in Putonghua(Mandarin)	Asking your need	Introducing one's nationality	Asking question with ma , wh words, affermative -negative	Application and usage of construction
	SLO-2	Tables of combination of initials and finals in Putonghua(Mandarin)	Nominal measure word	Asking about nationality	Lianxi	Lianxi
S-4	SLO-1	Prononciation of Pinyin chart	Telling phone number in chinese	Asking price	Asking question with ma , wh words, affermative -negative	Application and usage of construction
	SLO-2	Prononciation of Pinyin chart	Converting numbers	Lianxi	Lianxi	Lianxi
S-5	SLO-1	Introduction of FourTones in Chinese language.	Time & time related greetings,	Politely and formally asking names ,Expressing apology.	MakingChinese sentences with verbal & Adjectival predicate.	Grammar related to 但是，可是，以前，以后，后来。

	SLO-2	Four Tones and related pronunciation.	Days&Seasons.	Introduction & Application of verbal Measure Word.	Introduction of 地	Introduction & Application of the basic optative verbs like会，能，可以.
S-6	SLO-1	Tonesandhi（一，不）in Chinese Tone discrimination in Chinese	Sentence patterns in Chinese, S-V-O sentences.Framing simple sentences.	Make sentences with在,and few corelated words like 这儿，那儿 with example	Few basic verbs and adjectives.	conversation how todescribe likes ,dislikes, interest and hobbies
	SLO-2	Chinese characters. The eight strokes of characters, proper stoke orders.	Introduce 是 and 不是	Important locations used in daily life.	Opposite words.	Conduct conversation how todescribe likes, dislikes.,interest and hobbies
S-7	SLO-1	Pronounce word in proper tone	Vocabulary	Asking about places.	Usage of verbs	Usage of grammar
	SLO-2	Personal Pronouns and relations, Plural forms 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	Introducing each other	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 purchase products.
	SLO-2	Introduction of adverb 也，Interrogative particle呢，application & Usages.	Introduction of verb有 and it'snegative form .Nominal measure word.	Basic conversation about persons ouccupation	describe family members and talk about university and department	conversation how to bergain and purchase products.
S-10	SLO-1	Possesive/ Structural Particle的, application of 的with pronouns.	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	Writing Chinese characters basic conversation related to greetings	Framing of basic interrogative sentences with modal particle吗。	Introduction of past tense and aspect particle了。	application withexamples.	
S-11	SLO-1	Writing greetings in characters with proper stoke order	Asking simple question	Asking age	Asking about likes and dislikes	Asking about purchasing products
	SLO-2	练习	Asking date	lianxi	Asking about likes and dislikes	Asking about purchasing products
S-12	SLO-1	Basic Expression	Birthday in Chinese	Asking about occupation	Asking about family members	Usage of conjugation
	SLO-2	练习	Grammar – has, have	lianxi	Asking about family members	Usage of conjugation

Learning Resources	1. Liu Xun, New Practical Chinese reader, Beijing Language and Culture University Press, 2008	2. 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	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. Dr. Usha Kodandaraman, ABK AOTS, Chennai. drushak@gmail.com		1. Dr. S. P. Dhanavel, IIT Madras, dhanavelsp@iitm.ac.in		1.Ms. Poulomi Ghosal, SRMIST		
2. Mr. Paul Das, NEC, Chennai		2. Ms. Subashree, VIT, Chennai, subashree@vit.ac.in		2. Mr. Soumya Brata Halder, SRMIST		

Course Code	18LEH103J	Course Name	FRENCH	Course Category	H	Humanities and Social Sciences including Management	L	T	P	C
							2	0	2	3

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		Program Learning Outcomes (PLO)

			1	2	3		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Get to know about France, its culture, heritage and countries speaking French. Build basic abilities to converse in French		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)		Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design,	Modern Tool Usage	Society & Culture	Environment &	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLR-2 :	Identify and ask for information. Describe people with adjectives. Build conversational abilities																				
CLR-3 :	Ask for and Provide directions, Identify French educational system, Draft a curriculum vitae																				
CLR-4 :	Tell Time and converse in time related situations, Identify French etiquette																				
CLR-5 :	Appreciate French cuisine and their food habits																				
CLR-6 :	Utilize French language skills along with technical skills in build wider career orientations																				
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																				
CLO-1 :	Identify and pronounce French alphabets, Greet, Converse,Introduce, Read, identify basic French grammar		1	70	60		-	-	M	-	M	H	L	M	H	H	-	H	-	-	-
CLO-2 :	Identify French adjectives, verbs ending in"er" and frame simple sentences and make conversations		2	65	60		-	-	H	-	H	M	L	M	H	H	-	H	-	-	-
CLO-3 :	Orient someone by giving directions, Ask for directions, Express possession, conjugate verbs in "ir', Draft curriculum vitae		2	65	60		-	-	L	-	M	L	L	M	L	L	-	H	-	-	-
CLO-4 :	Express and use time, create a routine using reflexive verbs, conjugate a reflexive verb and regular verbs in "re"		3	75	65		-	-	H	-	H	H	L	M	H	H	-	H	-	-	-
CLO-5 :	Paragraph on French food habits and also their own using partitive articles. Alimentation is associated with partitive articles		3	75	65		-	-	H	-	H	H	L	M	M	H	-	H	-	-	-
CLO-6 :	Build listening, speaking, reading, writing abilities in French, To interact with French people and understand French culture		3	70	65		-	-	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(ne…plus, ne…. Jamais
	SLO-2	Les salutations	Les nombres 101 a 1000	Les articles contractes (du..)	La famille	La forme négative (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
	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	*Présenter qqn*	*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*	*Féliciter un 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%*	*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. Mr.D.Hemachandran, Renault Nissan, Senior Language Specialist	*1. Dr. S. P. Dhanavel, IIT Madras, dhanavelsp@iitm.ac.in*	*1. Dr. K. Anbazhagan, SRMIST* / *2. Ms. K. Sankari, SRMIST*
2. Mr. Durga Prasad Bokka, TCS Chennai, durgaprasad@tcs.com	*2. Ms. Judy Niranjala, SIET college for Women, Chennai*	*3. Mr. J. Sabastian Satish, SRMIST*

Course Code	18LEH104J	Course Name	GERMAN	Course Category	H	Humanities and Social Sciences including Management	L	T	P	C
							2	0	2	3

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	Program Learning Outcomes (PLO)

CLR-1 :	Get to know about Germany, its culture, heritage. Build basic abilities to converse in German		1	2	3		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	Identify and ask for information. Introduce oneself. Build conversational abilities		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)		Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design,	Modern Tool Usage	Society & Culture	Environment &	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLR-3 :	Ask for and Provide directions in German, Identify German cities, buildings and everyday life like cuisine																				
CLR-4 :	Develop the ability to read, understand and initiate a conversation																				
CLR-5 :	Enable basic conversational skills to behave in a German speaking society, in restaurants and in public places																				
CLR-6 :	Utilize German language skills along with technical skills in build wider career orientations																				
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																				
CLO-1 :	Identify and pronounce German alphabets, Greet, Converse,Introduce, Read, identify basic German grammar		1	70	60		-	-	L	L	M	H	L	H	H	H	-	H	-	-	-
CLO-2 :	Compose dialogue between strangers, ask simple information		2	65	55		-	-	M	L	M	H	L	H	H	H	-	H	-	-	-
CLO-3 :	Orient someone by giving directions,by using Imperatives and different types of definite & indefinite articles		2	73	60		-	-	M	M	H	M	M	H	H	H	-	H	-	-	-
CLO-4 :	Write a dialogue by using different verbs of Accusative articles		3	65	55		-	-	M	M	H	H	M	H	H	H	-	H	-	-	-
CLO-5 :	Create conversations in social places like; restaurants, identify and order food varieties		3	65	55		-	-	M	M	H	H	L	H	H	H	-	H	-	-	-
CLO-6 :	Build listening, speaking, reading, writing abilities in German, linteract with Germans and understand their culture		3	75	65		-	-	H	H	H	H	H	H	H	H	-	H	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Alphabets, Grüßen und Verabschieden.	UmbestimmtArtikel im Nominativ.	T, N, D verbenkonjugationen und Satzschreiben.	Die Uhezeiten verstehen und nennen.	Etwasgemeinsam planen, über Geburtstag sprechen.
	SLO-2	Über Länder, Sprachensprechenim Deutschland, WichtigeStädteim Deutschland.	Zahlenbis 1000 und Wortschatz.	Ordinal Zahlen und Tagezeiten	Zeitangabenmachen.	Schreiben Sie: Einladung für ihre Geburtstag.
S-2	SLO-1	Zahelenbis 20, Sich und andere Vorstellen.	Plätze und Gebäudebe nennen, Fragenzuortenstellen.	Überessensprechen,VerschiedeneGerichte in Deutschland durch PPT.	Umregelmäßige verbenkonjugationen und BeispieleSatz.	Possessive Artikel im Akkuativ.
	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 Zeit schreiben.	E-mail schreiben: Einladung ihrer Geburtstagsferier.
	SLO-2	Verabschiedenen Wörten.	Buchstabieren und Wortschtz.	Hören und buchstabieren.	Übungen.	Übungen.
S-4	SLO-1	Länder, 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 verbeneigene Sätze schreiben	Das Gesprächhören und verstehen.
	SLO-2	Übungen.	Sprechen über den wichtige Städte im Deutschland.	Übungen.	"ieren" verben konjugationen.	Wortschatz und buchstabieren.
S-5	SLO-1	Über Länder und Sprachensprechen.	Himmelsrichtungen und Verkehrsmittel nennen.	Einen Einkauf Planen und sprechen	Über die Familiesprechen und sichverabreden.	Das Briefeschreiben erklären, eineEinldung verstehen und schreiben.

	SLO-2	*Hören und buchstabieren.*	*NachdemWegfragen und einem Wegbeschreiben*	*Gespräche beim Einkauf führen.*	*Sich für eine verspätung entschuldigen.*	*Personal pronomen und beispieleSätze.*
S-6	SLO-1	*Aussagesatz und personal pronomen in Nominativ und beispieleSätze.*	*Texte mit internationalenwörtern verstehen.*	*Gesprächebeim Essen führen.*	*EinenTermin telefonisch vereinbaren.*	*ImRestaurentbestellen und bezahlen, übereinEreignis sprechen,*
	SLO-2	*ÜberArbeit, Berufe und Arbeitszeitensprechen.*	*Artikel lernen.*	*W-fragen texte verstehen.*	*Schreiben Sie die Uhrzeiten.*	*BestimmtInformationen in Texten finden.*
S-7	SLO-1	*Übersich und anderesprechen.*	*Hörübung: Schreiben Sie die Zahlen.*	*Kurzer Dialog über das Einkaufen.*	*Üben: Wie man den Termin festlegt.*	*Schreiben eines Briefes über jede gegebene situation.*
	SLO-2	*Fragen und antworten.*	*Events im Hamburg.*	*Übungen: Verben konjugationen.*	*Hören und buchstabieren.*	*Übungen: Trennbare Verben konjugationen.*
S-8	SLO-1	*Sich und anderevorstellen.*	*Fragen Sie die Wegbeschreibung in dem sie die Bildersehen.*	*Kurzer Dialog über das Essen.*	*Hörübung: Die Zeit durch hören des Dialogs schreiben.*	*Hörübung und Schreiben: Freizeitaktivitäten.*
	SLO-2	*W-Fragen.*	*Lesen und verstehen.*	*Hören: wie man bestellt.*	*Übungen.*	*Satzmithilfsverben.*
S-9	SLO-1	*Zahlen ab 20 nennen, über Jahrezeiten im Deutschland.*	*Imperativ mit Sie, Lesen und verstehen.*	*Wortschatz und Buchstabieren.*	*Umbestimmt Artikel im Akkusativ.*	*Untrennbare verben konjugationen. Beispiele Sätze.*
	SLO-2	*Wochentage und Monate.*	*Lange und KurzeVokale.*	*Schreiben Sie die Sätze.*	*Zeitangabenmit am, um, von…. bis.*	*BeispieleSätze.*
S-10	SLO-1	*Bestimmt Artikel in Nominativ.*	*Regelmäßige verben Konjugationen.*	*PositionenimSatz, Bestimmt Artikel im Akkusativ.*	*Erklärt die Grammatik Präpositionen im Akkusativ.*	*Präteritum von Hilfsverben und konjugationen.*
	SLO-2	*Verwendungen von Hilfsverben.*	*Satzschreiben.*	*AkkusativVerben konjugationen.*	*Beispiele**Sätze im** Präpositionen **.***	*Modal verben konjugationen und beispiele **Sätze.***
S-11	SLO-1	*Ja oder NeinFragen durch PPT.*	*Der Imperetivsätze und auch die Regelmäßigeverben*	*Essen im D-A-CH, Beruferund ums Essen.*	*Hören und sprechen: die Tagesablauf.*	*Übung für Modal verben wie, Aussagesatz, Satzfrage.*
	SLO-2	*Typische Hobby's.*	*Lernen Sie die Sätze durch PPT.*	*Hören Sie 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: Frühstück bei 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	*Über deineFamilie.*	*Claudia Berg in der Arbeit.*	*Einkaufen planen.*	*Der Termin und die Verabredung.*	*Schreiben Sie die Sätze mit Hilfs verben.*

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	*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. Dr. Usha Kodandaraman, ABK AOTS, Chennai. drushak@gmail.com	*1. Dr. S. P. Dhanavel, IIT Madras, dhanavelsp@iitm.ac.in*	*1. Dr. K. Anbazhagan, SRMIST* *2. Dr. P. Tamilarasan, SRMIST*
2.Mr. Vivek Raghunathan, Health care, vivek.raghunathan@waikatodhb.health.nz	*2. Ms. Subashree, VIT, Chennai, subashree@vit.ac.in*	*3. Ms. Srilitha Srinivasan, SRMIST*

Course Code	18LEH105J	Course Name	JAPANESE	Course Category	H	Humanities and Social Sciences including Management	L	T	P	C
							2	0	2	3

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	Program Learning Outcomes (PLO)

			1	2	3		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Identify the basics of Japan language and the facts of Japan, Make useful expressions and basic conversations.		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 :	Identify someone and ask for information. Physical description of people with adjectives. Focus of basic conversation																				
CLR-3 :	Ask and give directions, Use conversation on orientation. Identify the Japan educational system																				
CLR-4 :	Create daily activities and tell time. Appreciate Japan etiquette. Conjugate a reflexive verb and 3rd group of regular verbs																				
CLR-5 :	Identify diverse food habits of the Japanese people.																				
CLR-6 :	Utilize Japan language skills along with technical skills in build wider career orientations																				
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																				
CLO-1 :	Identify, pronounce Japan alphabets, know about Japan, its culture. Greet each other and converse, Introduce oneself		1	70	60		M	L	L	L	M	H	M	H	H	M	L	H	-	-	-
CLO-2 :	Describe with the help of Japan adjectives, identify first group verbs ending in e. Frame simple sentences		2	65	65		M	L	L	L	M	H	M	H	H	M	L	H	-	-	-
CLO-3 :	Orient someone by giving directions, Express possession and conjugate 2nd group verbs. Draft their own curriculum vitae		2	65	65		M	L	L	L	M	H	M	H	H	M	L	H	-	-	-
CLO-4 :	Express time and use expressions of time in daily conversations, paragraph on daily routine with the help of reflexive verbs		3	75	65		M	L	L	L	M	H	M	H	H	M	L	H	-	-	-
CLO-5 :	Create a paragraph on the food habits of the Japan people and also their own using particles.		3	75	65		M	L	L	L	M	H	M	H	H	M	L	H	-	-	-
CLO-6 :	Build listening, speaking, reading, writing abilities in Japan, To interact with Japan people and understand Japan culture		3	75	65		M	L	L	L	M	H	M	H	H	M	L	H	-	-	-

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 9 Renshuu
	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	Self Introduction	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	Lesson 1– reading.Self introduction	Ra/Wa series related words	iku, miru, yasumu and kau	Body parts (vocabulary).	Line
S-4	SLO-1	Lesson 1 grammar (wa,ka,mo,no,desu/ja arimasen)	Lesson 3 – renshuu and exercises	***Revision of complete Hiragana***	Explanation of past tense of verbs.	Lesson 10 - reading and grammar
	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	*Ojigi and 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 ~masen ka*	*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 5Grammar.*	*Lesson 6 – reading and grammar*	*Stationery*	*Japanese Economy*
	SLO-2	*Colours and 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%*	*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
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2. Mr. Paul Das, NEC, Chennai	*2. Dr. K. Anbazhagan, SRMIST*	*2. Mr. B.Vijaya Kumar,SRMIST*

Course Code	18LEH106J	Course Name	KOREAN	Course Category	H	Humanities and Social Sciences including Management	L	T	P	C
							2	0	2	3

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	Program Learning Outcomes (PLO)

			Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)		Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design,	Modern Tool Usage	Society & Culture	Environment &	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
			1	2	3		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Know about Korea and its culture; to be able to read, write the Korean script, and to introduce oneself and other people																				
CLR-2 :	Manage daily life living in Korea. Talking daily activities. Asking for and giving directions, describing the location																				
CLR-3 :	Be able to shop by asking for the availability of things, and learning about the currency system																				
CLR-4 :	Tell time, to socialize: make appointments, talk about weekend plans/activities																				
CLR-5 :	Communicate about studying Korean and about future career or academic plans																				
CLR-6 :	Utilize Korean language skills along with technical skills in build wider career orientations																				
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																				
CLO-1 :	Read, pronounce and write the Korean script, Introduce oneself and other people. Get to know about Korea and its culture		1	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		2	65	65		-	-	L	-	H	M	L	M	H	H	-	H	-	-	-
CLO-3 :	Talk about past activities (past tense), the weather and use the Korean currency		2	65	65		-	-	L	-	M	H	L	M	M	M	-	H	-	-	-
CLO-4 :	Tell time, to socialize: make appointments, talk about weekend plans/activities		3	75	65		-	-	L	-	H	H	L	M	H	H	-	H	-	-	-
CLO-5 :	Communicate about studying Korean and about future career or academic plans		3	75	65		-	-	L	-	H	M	L	M	H	H	-	H	-	-	-
CLO-6 :	Build listening, speaking, reading, writing abilities in Korean, To interact with Korean people and understand Korean culture		3	75	65		-	-	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, 한국소개	2. 일상생활daily life, new vocab (action, places)	listening &key sentences drilling	dialogue1& dialogue2 practice	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-에가다	5.쇼핑2 shopping2 new vocab (counter noun)	listening &key sentences drilling	dialogue1& dialogue2 practice
	SLO-2				reading/writing	
S-3	SLO-1	이중모음과자음 double vowels & basic consonants	dialogue1& dialogue2 practice	grammar point1-ㅂ니다/습니다,-ㅂ니까/습니까&	8.시간 time new vocab (time)	listening & reading
	SLO-2					
S-4	SLO-1	쌍자음과음절double consonants & syllables	listening & reading/writing	teaching money	Teaching date & weeks	writing for weekend activities
	SLO-2					
S-5	SLO-1	받침과음절1 Batchim & syllables	3.위치/location new vocab(object /location)	dialogue1& dialogue2practice	grammar point1-에	11.한국어공부(studying Korean) new vocab(pronouns)
	SLO-2				grammar point2-시-분	
S-6	SLO-1	받침과음절2 Batchim & syllables	grammar point1-이/가	listening &key sentences drilling	dialogue1& dialogue2practice	grammar point1- 나/저, 내/제
	SLO-2		grammar point2-에있다/없다	reading/writing		grammar point2-'ㄷ' irregular verbs
S-7	SLO-1	자모연습. (practices vowels and consonants)	dialogue1& dialogue2practice	6.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. 교실표현(listening & class terms)	listening &key sentences drilling	grammar point1-았/었	9.약속 appointment new vocab(location& plan	listening &key sentences drilling

	SLO-2		*reading/writing*	*grammar point2-에서*		*reading/writing*
S-9	**SLO-1**	*1.자기소개self –introduction , new vocab(nationality, occupation*	***4.***쇼핑*1shopping1 new vocab (items to shop)*	*dialogue1& dialogue2 practice*	*grammar point1- (으)ㄹ까요*	*12.계획(plan) –(으)ㄹ거예요.*
	SLO-2				*grammar point2-아요/어요*	
S-10	SLO-1	*grammar point1-이에요/예요*	*shopping1teaching numbers*	*listening &key sentences drilling*	*dialogue1& dialogue2practice*	*grammar point1- pro nouns이/그/저 +것(things)*
	SLO-2	*grammar point2-은/는*		*reading/writing*		*grammar point2- 'ㅡ' irregular verbs & dialogue2*
S-11	SLO-1	*dialogue1& dialogue2practice*	*grammar point1-을/를*	*7. 날씨/ weather new vocab(season& weather)*	*listening &key sentences drilling*	*dialogue1& dialogue2practice*
	SLO-2		*grammar point2-(으)세요*		*reading/writing*	
S-12	SLO-1	*listening &key sentences drilling*	*dialogue1& dialogue2practice*	*grammar point1-그리고*	*10.주말활동 (weekend activities) new vocab (places& weekend activities)*	*listening &key sentences drilling*
	SLO-2	*reading/writing*		*grammar point2-안*		*reading/writing*

Learning Resources	1. Sejong Korean 1, The National Institute of the Korean Language. Hawoo Publisher, 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 %	

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Course Code	18PDH101T	Course Name	GENERAL APTITUDE	Course Category	H	Humanities and Social Sciences including Management	L	T	P	C
							0	0	2	1

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	Program Learning Outcomes (PLO)

		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design,	Modern Tool Usage	Society & Culture	Environment &	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Recapitulate fundamental mathematical concepts and skills																		
CLR-2 :	Hone critical thinking skills by analyzing the arguments with explicit and implicit premises																		
CLR-3 :	Sharpen logical reasoning through skillful conceptualization,																		
CLR-4 :	identification of relationships between words based on their function, usage and characteristics																		
CLR-5 :	nurture passion for enriching vocabulary																		
CLR-6 :	Acquire 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:																		
CLO-1 :	Build a strong base in the fundamental mathematical concepts	2	80	75	L	H	-	H	M	-	-	-	H	H	L	H	-	-	-
CLO-2 :	Identify the approaches and strategies to solve problems with speed and accuracy	2	75	70	-	H	-	H	M	-	-	-	H	H	-	H	-	-	-
CLO-3 :	Gain appropriate skills to succeed in preliminary selection process for recruitment	2	80	75	-	H	-	H	M	-	-	-	H	H	L	H	-	-	-
CLO-4 :	Collectively solve problems in teams and groups	3	75	70	L	H	-	H	M	-	-	-	H	H	-	H	-	-	-
CLO-5 :	Build vocabulary through methodical approaches	3	85	80	-	H	-	H	M	-	-	-	H	H	L	H	-	-	-
CLO-6 :	Enhance lexical skills through systematic application of concepts and careful analysis of style, syntax, semantics and logic	2	85	80	-	H	-	H	M	-	-	-	H	H	-	H	-	-	-

Duration (hour)		6	6	6	6	6
S-1	SLO-1	Types of numbers, Divisibility tests	Square root, Cube roots, Remainder	Percentage Introduction	Discount	Logarithms Intro
	SLO-2	Solving Problems	Solving Problems	Solving Problems	Solving Problems	Solving Problems
S-2	SLO-1	Introduction to Significance of Verbal Aptitude in Competitive Examinations	Contextual Vocabulary Exercise – Synonyms	Sentence Completion Basic Level Exercises – Single Blank	Reading Comprehension – Introduction	Grammar Rules – A comprehensive Introduction
	SLO-2	Solving Problems	Solving Problems	Solving Problems	Solving Problems	Solving Problems
S-3	SLO-1	LCM and GCD	Identities	Percentage Problems	Simple Interest	Logarithms Rules
	SLO-2	Solving Problems	Solving Problems	Solving Problems	Solving Problems	Solving Problems
S-4	SLO-1	Vocabulary enrichment techniques	Contextual Vocabulary Exercise - Synonyms	Sentence Completion Basic Level Exercises – Double Blank	Reading Comprehension – Summary & Main Idea	Sentence Completion - Grammar
	SLO-2	Solving Problems	Solving Problems	Solving Problems	Solving Problems	Solving Problems
S-5	SLO-1	Unit digit, Number of zeroes, Factorial notation	Fractions and Decimals, surds	Profit and Loss	Compound Interest, Installments	Linear Equations
	SLO-2	Solving Problems	Solving Problems	Solving Problems	Solving Problems	Solving Problems

S-6	SLO-1	*Vocabulary enrichment Techniques*	*Contextual Vocabulary Exercise - Antonyms*	*Cloze Test*	*Reading Comprehension – Summary & Main Idea*	*Spotting Errors*
	SLO-2	*Solving Problems*	*Solving Problems*	*Solving Problems*	*Solving Problems*	*Solving Problems*

Learning Resources	1. *Nishit K. Sinha, The Pearson Guide to Quantitative Aptitude and Data Interpretation for the CAT* 2. *Dinesh Khattar-The Pearson Guide to QUANTITATIVE APTITUDE for competitive examinations* 3. *Charles Harrington Elstor, Verbal Advantage: Ten Easy Steps to a Powerful Vocabulary, Random House Reference, 2002* 4. *Merriam Webster's Vocabulary Builder, Merriam Webster Mass Market, 2010*	5. *Norman Lewis, How to Read Better and Faster, Goyal, 4th Edition* 6. *Franklin GRE Word List, 3861 GRE Words, Franklin Vocab System, 2014Wiley's GMAT Reading Comprehension Grail, Wiley, 2016* 7. *Manhattan Prep GRE : Reading Comprehension and Essays, 5th Edition* 8. *Martin Hewings, Advanced Grammar in Use. Cambridge University Press, 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	-	*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
1. Mr.Pratap Iyer, Study Abroad Mentors,pratap.iyer30@gmail.com	*1. Mr Nishith Sinha, dueNorth India Academics LLP, nsinha.alexander@gmail.com*	*1. Dr. P. Madhusoodhanan, SRMIST* *2. Dr. M. Snehalatha, SRMIST*
2. Mr Ajay Zenner, Career Launcher, ajay.z@careerlauncher.com	*2. Dr.Dinesh Khattar, Delhi University, dinesh.khattar31@gmail.com*	*3. Mr Jayapragash J, SRMIST* *4. Mrs. Rukmani, SRMIST*

Course Code	18PDH102T	Course Name	MANAGEMENT PRINCIPLES FOR ENGINEERS	Course Category	H	Humanities and Social Sciences including Management	L	T	P	C
							2	0	0	2

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			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Acquire knowledge about the fundamental concepts of organization and management	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design,	Modern Tool Usage	Society & Culture	Environment &	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLR-2 :	Make decision strategies, planning process, tools and techniques																		
CLR-3 :	Inculcate the traits needed to be an effective leader and familiarize with the organizational structures and design																		
CLR-4 :	Gain valuable insights into strategic process, formulation and implementation																		
CLR-5 :	Utilize the intricacies involved in cultural and ethical issues of people																		
CLR-6 :	Utilize the dimensions of the planning-organizing-leading-controlling (P-O-L-C) framework																		
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																		
CLO-1 :	Observe and evaluate the various influencing factors on the current practice of organization and management	3	80	75	-	H	-	-	-	L	-	H	H	M	-	M	-	-	-
CLO-2 :	Use the techniques and tools of planning and make prudent decisions	2	80	75	-	M	-	-	-	H	-	H	H	M	-	H	-	-	-
CLO-3 :	Identify how organizations adapt to uncertain environment, identify techniques managers use to influence and control the internal environment	2	80	75	-	L	-	-	-	M	-	H	H	H	-	M	-	-	-
CLO-4 :	Apply and execute management goals	2	80	75	-	L	-	-	-	M	-	H	M	H	-	M	-	-	-
CLO-5 :	Manage people and deal with cultural and ethical issues	3	80	75	-	H	-	-	-	H	-	H	H	H	-	H	-	-	-
CLO-6 :	Utilize the basic fundamentals of managing organizations and utilize optimal resources	3	80	75	-	H	-	-	-	M	-	M	M	H	-	M	-	-	-

Duration (hour)		6	6	6	6	6
S-1	SLO-1	Organization	Information technology and the new workplace	Organisational control	Strategic management	People Management
	SLO-2	The Individual and the Organization	Precautious Measures	Control in the Business Setting	Role of Strategy in Management	Importance of people
S-2	SLO-1	Management	Information and decision making	Motivation	Evaluating the Business Environment	Attracting a Quality Workforce
	SLO-2	Primary Functions of Management	Styles of Decision Making	Importance of Employee Motivation	Common Frameworks for Situational Analysis	Recruiting process
S-3	SLO-1	Role of management in organisation	The decision-making process	Leadership	Goals and Process	Employee Diversity
	SLO-2	Advantages of Managing People Well	Barriers to Individual Decision Making	Effective Leader	strategic competitiveness	Conflict Management
S-4	SLO-1	Types of Managers	Planning	Organising	Different Strategies	Organisational Culture
	SLO-2	Role of managers	Planning and Mission	Purpose of Organization	Stages and Types of Strategy	Influences on Organizational Culture
S-5	SLO-1	management Thought	The planning process	organisational design	Strategy formulation	Initiating and Fostering Cultural Change
	SLO-2	Management Roles	The Planning Cycle	Common Organizational Structures	Bridging the Gaps	Putting It Together: Culture and Diversity
S-6	SLO-1	Environmental Factors	tools, techniques and processes	Factors Impacting Organizational Design	Strategy implementation	Ethics

	SLO-2	*Internal and External Factors*	*Putting It Together: Planning and Mission*	*Contingencies*	*Overcoming Hindrances*	*Cultural Issues*

Learning Resources	9. *Schermerhorn, J.R.,Introduction to Management, 13th ed., Wiley; 2017* 10. *Harold Koontz, Heinz Weihrich, Essentials of management: An International & Leadership Perspective, 10th ed., Tata McGraw -Hill Education, 2015*	11. *Stephen Robbins, Mary Coulter, Fundamentals of Management , 9th ed., Pearson Education, 2016* 12. *Samuel C. Certo, Tervis Certo, Modern management: concepts and skills, 12th ed., Pearson, 2012* 13. *Charles W. L. Hill, Steven Mcshane, Principles of Management McGraw Hill Education, 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	*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
1. Mr. Pratap Iyer, Study Abroad Mentors, Mumbai, pratap.iyer30@gmail.com	*1. Dr. A.K. Sheik Manzoor, Anna University, sheikmanzoor@annauniv.edu*	*1. Mr. Mohamed Ibrahim. A. U., SRMIST*
2. Mr. Ajay Zenner, Career Launcher, ajay.z@careerlauncher.com	*2. Dr. Devamainthan, University of Madras*	*2. Mr. Muthu Manivannan, SRMIST*

Course Code	18PDH103T	Course Name	SOCIAL ENGINEERING	Course Category	H	Humanities and Social Sciences including Management	L	T	P	C
							2	0	0	2

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			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	create personal awareness and responsibility	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design,	Modern Tool Usage	Society & Culture	Environment &	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLR-2 :	learn about environment and approach towards social issues																		
CLR-3 :	train students on social competencies to become self reliant, resourceful and industrious																		
CLR-4 :	understand social entrepreneurship																		
CLR-5 :	develop a mindset to contribute to the society																		
CLR-6 :	apply knowledge, passion and skills in the pursuit of humanitarian goals																		
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																		
CLO-1 :	identify and addresses needs of social responsibilities	2	80	75	-	-	-	-	-	M	M	H	H	H	-	-	-	-	-
CLO-2 :	resolve social problems	3	80	75	-	-	-	-	-	H	L	M	H	M	-	-	-	-	-
CLO-3 :	understand social responsibility competencies and CSR activities	2	80	75	-	-	-	-	-	M	L	L	H	H	-	-	-	-	-
CLO-4 :	build a business plan to meet social needs	3	80	75	-	-	-	-	-	M	L	H	H	M	-	-	-	-	-
CLO-5 :	gain real time experience through student social responsibility project and presentation	3	80	75	-	-	-	-	-	H	M	H	H	M	-	-	-	-	-
CLO-6 :	possess an in-depth knowledge of social engineering and effect a social change in the society	3	80	75	-	-	-	-	-	H	M	M	M	M	-	-	-	-	-

Duration (hour)		6	6	6	6	6
S-1	SLO-1	*Introduction*	*Environment and society*	*Social responsibility competencies*	*Social entrepreneurship*	*Student Social responsibility*
	SLO-2	*Importance of Social Engineering*	*Contribution towards environment*	*Social responsibility competencies*	*Social entrepreneurship*	*Student Social responsibility*
S-2	SLO-1	*Personal awareness*	*Social issues*	*Social responsibility competencies-Profiles*	*Social Entrepreneur*	***Project Presentation***
	SLO-2	*Types of responsibilities*	*Social issues*	*Social responsibility competencies-Facets*	*Types of Social Entrepreneurs*	***Project Presentation***
S-3	SLO-1	*Social Change*	*Group discussion on social Issues*	*Contributing to community*	*Success stories of social entrepreneur*	***Project Presentation***
	SLO-2	*Social Change*	*Group discussion on social Issues*	*Contributing to community*	*Impact of social entrepreneurs in society*	***Project Presentation***
S-4	SLO-1	*Vision towards society*	*Group discussion on social Issues*	*Value diversity and Building relationships*	***Business Plan***	*Project Presentation*
	SLO-2	*Mission towards society*	*Group discussion on social Issues*	*Value diversity and Building relationships*	***Business Plan***	***Project Presentation***
S-5	SLO-1	*Individual social responsibility(ISR)*	*Social Marketing*	*Corporate social responsibility*	***Business Plan***	*Report Analysis*
	SLO-2	*Individual social responsibility(ISR)*	*Social Marketing*	*Types of CSR*	***Business Plan***	*Report Analysis*
S-6	SLO-1	*Case study*	*Non profitable organizations*	***Government Policies on CSR***	***Business Plan***	*Report Analysis*

	SLO-2	*Case study*	*Types of NGO*	***Government Policies on CSR***	***Business Plan***	*Report Analysis*

Learning Resources	1. *Joel Makeower, Beyond The Bottom Line: Putting Social Responsibility to work for your Business and the World,Oct,1995* 2. *Simen Sinek, Start with Why, How great leaders Inspire Everyone to Take Action, Penguin UK, 2011* 3. *Adam Grant, Give and Take: Why Helping others drives our success, Orion Publishing Group, 2014* 4. *David Bornstien, How to change the world, Oxford University Press, 2007*	5. *Nicholls,Alex,ed., Social Entrepreneurship – New Models of Sustainable Social Change, Oxford University Press, 2008* 6. *Ronald R. Sims, Ethics and Corporate Social Responsibility: Why Giants fall, 2003* 7. *Robert A. Rohm, Positive Personality Profiles, Personality Insights, Inc, 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	*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
1. Mr. Vijay Nair – Director, Education Matters, vijayn@edmat.org	*1. Dr. A.K. Sheik Manzoor, Anna University, sheikmanzoor@annauniv.edu*	*Mrs. Kavitha Srisaran, SRMIST*
2. Mr. Ajay Zenner, Career Launcher, ajay.z@careerlauncher.com	*2. Dr Vanitha. J., Loyola College, vanithaj@loyolacollege.edu*	*Mr. Priyanand P., SRMIST*

Course Code	18PYB103J	Course Name	PHYSICS: SEMICONDUCTOR PHYSICS	Course Category	B	Basic Sciences	L	T	P	C
							3	1	2	5

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 :	Introduce band gap and fermi level in semiconductors		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)		Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design,	Modern Tool Usage	Society & Culture	Environment &	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLR-2 :	Explain the concept of carrier transport mechanism in p-n and metal semiconductor junction																				
CLR-3 :	Provide an insight on semiconductor optical transitions and photovoltaic effect																				
CLR-4 :	Procure knowledge of electricaland optical measurements in semiconductor																				
CLR-5 :	Develop necessary skills for low dimensional semiconductor material processing and characterization																				
CLR-6 :	Utilize the concepts in physics for the understanding of engineering and technology																				
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																				
CLO-1 :	Identify the energy band in solids and electron occupation probability		2	85	75		H	H	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-2 :	Analyze the working of optoelectronic devices		2	75	70		H	H	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-3 :	Apply the knowledge to the development of new and novel optoelectronic devices		2	80	75		H	-	-	H	-	-	-	-	-	-	-	-	-	-	-
CLO-4 :	Identify the working mechanism of electrical and optical measurements		2	75	70		H	H	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-5 :	Utilize the knowledge of the low dimensional semiconductor material fabrication and characterization.		2	80	70		H	-	H	-	-	-	-	-	-	-	-	-	-	-	-
CLO-6 :	Apply the concepts of semiconductor physics in real time applications		2	80	70		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Duration (hour)		18	18	18	18	18
S-1	SLO-1	Classical Free electron theory	Intrinsic semiconductor	Concept of optical transitions in bulk semiconductors	Concept of electrical measurements	Density of states in 2D
	SLO-2	Quantum Free electron theory	Fermi level on carrier-concentration and temperature in Intrinsic semiconductor	optical absorption process	Two-point probe technique	Density of states in 1D and 0 D
S-2	SLO-1	Density of states	Extrinsic semiconductors	Concept of recombination process	Four-point probe technique-linear method	Introduction to low dimensional systems
	SLO-2	Energy band in solids	Fermi level on carrier-concentration and temperature in extrinsic semiconductors	Optical recombination process	Four-point probe technique-Van der Pauw method	Quantum well
S-3	SLO-1	Kronig-Penney model	Explanation for carrier generation	Explanation for spontaneous emission	Significance of carrier density	Quantum wire and dots
	SLO-2	Kronig-Penney model	Explanation for recombination processes	Explanation for stimulated emission	Significance of resistivity and Hall mobility	Introduction to novel low dimensional systems
S-4	SLO-1	Solving problems	Solving problem	Solving problem	Solving problem	Solving problem
	SLO-2	Solving problems	Solving problem	Solving problem	Solving problem	Solving problem
S 5-6	SLO-1	Basics of experimentation	Study of I-V characteristics of a light dependent resistor (LDR)	Characterization of pn junction diode (Forward Bias)	Determine Particle Size ofSemiconductor Laser	Determine of efficiency of solar cell
	SLO-2					
S-7	SLO-1	E-k diagram	Carrier transport - diffusion and drift current	Joint density of states in semiconductor	Hot-point probe measurement	CNT- properties and synthesis
	SLO-2	Direct and Indirect band gap	Continuity equation	Density of states for photons	capacitance-voltage measurements	Applications of CNT

S-8	**SLO-1**	*Concept of phonons*	*p-n junction*	*Explanation of transition rates*	*Extraction of parameters in a diode*	*Fabrication technique-CVD*
	SLO-2	*Concept of Brillouin Zone*	*Biasing concept in p-n junction*	*Fermi's golden rule*	*I-V characteristics of a diode*	*Fabrication technique-PVD*
S-9	SLO-1	*Energy band structure of semiconductor-Brillouin zone*	*Metal-semiconductor junction -Ohmic contact*	*Concept of optical loss*	*Principle of Deep-level transient spectroscopy (DLTS)*	*Characterizations techniques for low dimensional systems*
	SLO-2	*Concept of effective mass*	*Metal-semiconductor junction - Schottky junction*	*Concept of optical gain*	*Instrumentation of DLTS*	*XRD-Powder method*
S-10	SLO-1	*Solving problems*	*Solving problem*	*Solving problem*	*Solving problem*	*Solving problem*
	SLO-2	*Solving problems*	*Solving problem*	*Solving problem*	*Solving problem*	*Solving problem*
S 11-12	SLO-1 SLO-2	*Determine Hall coefficient of Semiconductor material*	*Determine Band Gap of semiconductor-Four probe method*	*Repeat/Revision of experiments*	*Attenuation, propagation characteristic of optical fiber cable using laser source*	*Determine lattice parameters using powder XRD*
S-13	SLO-1	*Classification of electronic materials*	*Semiconductor materials of interest for optoelectronic devices*	*Basic concepts of Photovoltaics*	*Significance of band gap in semiconductors*	*Principle of electron microscopy*
	SLO-2	*Fermi level*	*Photocurrent in a P-N junction diode*	*Photovoltaic effect*	*Concept of absorption and transmission*	*Scanning electron microscopy*
S-14	SLO-1	*Probability of occupation*	*Light emitting diode*	*Applications of Photovoltaic effect*	*Fundamental laws of absorption*	*Transmission electron microscopy*
	SLO-2	*Influence of donors in semiconductor*	*Classification of Light emitting diode*	*Determination of efficiency of a PV cell*	*Instrumentation of UV-Vis spectroscopy*	*Atomic force microscope*
S-15	SLO-1	*Influence of acceptors in semiconductor*	*Optoelectronic integrated circuits*	*Theory of Drude model*	*Determination of band gap by UV-Vis spectroscopy*	*Heterojunctions*
	SLO-2	*Non-equilibrium properties of carriers*	*Organic light emitting diodes*	*Determination of conductivity*	*Concept of Photoluminescence*	*Band diagrams of heterojunctions*
S-16	SLO-1	*Solving problems*	*Solving problem*	*Solving problem*	*Solving problem*	*Solving problem*
	SLO-2	*Solving problems*	*Solving problem*	*Solving problem*	*Solving problem*	*Solving problem*
S 17-18	SLO-1 SLO-2	*Determine Band Gap of semiconductor-Post Office Box method*	*Study of V-I and V-R characteristics of a solar cell*	*To verify Inverse square law of light using a photo cell.*	*Characteristic of p-n junction diode under reverse bias*	*Mini Project*

Learning Resources	*1. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc.1995.* *2. B. E. A. Saleh and M. C. Teich, Fundamentals of Photonics, John Wiley & Sons, Inc., 2007.*	*3. S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley 2008.* *4. A. Yariv and P. Yeh, Photonics:Optical Electronics in Modern Communications, OxfordUniversity Press, New York 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	*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
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Course Code	18CYB101J	Course Name	CHEMISTRY	Course Category	B	Basic Sciences	L	T	P	C
							3	1	2	5

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

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

			Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design,	Modern Tool Usage	Society & Culture	Environment &	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
			1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Utilize the atomic and molecular manipulation towards the design of new materials																			
CLR-2 :	Employ various spectroscopic techniques in identifying the structure and correlate it with their properties																			
CLR-3 :	Exploit the periodic properties of elements for bulk property manipulation towards technological advancement																			
CLR-4 :	Address concepts related to electrochemistry, such as corrosion, using thermodynamic principles																			
CLR-5 :	Employ various organic reactions towards the design of fine chemical and drug molecules for industries																			
CLR-6 :	Utilize the basic chemistry principles applied in various engineering problems and identify appropriate solutions																			
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																			
CLO-1 :	Analyze atomic, molecular orbitals of organic, inorganic molecules to identify structure, bonding, molecular energy levels		2	70	65	H	-	H	-	-	-	-	-	-	-	-	-	-	-	-
CLO-2 :	Utilize the principles of spectroscopic technique in analysing the structure and properties of molecules		2	80	70	H	-	-	H	H	-	-	-	-	-	-	-	-	-	-
CLO-3 :	Rationalize bulk properties using thermodynamic considerations and periodic properties of elements		2	75	60	-	H	-		-	-	-	-	-	-	-	-	-	-	-
CLO-4 :	Utilize the concepts of thermodynamics in understanding thermodynamically driven chemical reactions		2	70	70	H	H	-	H	-	-	-	-	-	-	-	-	-	-	-
CLO-5 :	Perceive the importance of stereochemistry in synthesizing organic molecules applied in pharmaceutical industries		2	80	70	-	H	H	-	-	-	-	-	-	-	-	-	-	-	-
CLO-6 :	Utilize concepts in chemistry for technological advancement based on electronic, atomic and molecular level modification		2	75	65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Duration (hour)		18	18	18	18	18
S-1	SLO-1	Schrodinger equation-introduction	Crystal field theory-Explanation	surface characterization techniques – XPS - Introduction	Hard soft acids and bases	Optical activity, absolute configurations
	SLO-2	Schrodinger equation-Derivation	Crystal field theory-Explanation	surface characterization techniques – XPS - Explanation	Hard soft acids and bases	conformational analysis
S-2	SLO-1	Particle in a box solutions	Energy level diagrams for transition metal ions	Diffraction and scattering of solids	Thermodynamic functions: energy	Isomerism in transitional metal compounds-Introduction
	SLO-2	Applications for conjugated molecules	Energy level diagrams for transition metal ions	Explanation	Entropy and free energy	Isomerism in transitional metal compounds-Types
S-3	SLO-1	Forms of the hydrogen atom wave functions	Magnetic properties of transition compounds	Ionic, dipolar interactions	Estimation of entropy	Introduction to reactions involving substitution
	SLO-2	plots of these functions to explore their spatial variations	Magnetic properties of transition compounds	Van der Waals interactions	Estimation of free energies.	Addition reaction
S-4	SLO-1	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session
	SLO-2	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session
S 5-6	SLO-1 SLO-2	Lab Introduction	Estimate of amount of chloride content in a water sample.	Determine strength of a mixture of acetic and hydrochloric acid by conductometry.	Determine adsorption of oxalic/acetic acid from aqueous soln. by activated charcoal	***Experiment - Repeat - 2***
S-7	SLO-1	Molecular orbitals of diatomic molecules-Homonuclear	Principles of spectroscopy-Introduction	Equations of state of real gases	Free energy and emf. Cell potentials	Elimination reaction
	SLO-2	Heteronuclear diatomic molecules	Principles of spectroscopy-Explanation	critical phenomena	The Nernst equation and applications	Oxidation reaction
S-8	SLO-1	Equations for atomic orbitals	Selection rules-Introduction	Effective nuclear charge, penetration of orbitals	Acid base, oxidation reduction	Reduction reaction

	SLO-2	*Equations for molecular orbitals*	*selection rules-Explanation*	*variations of s, p, d and f orbital energies of atoms in the periodic table*	*Solubility equilibria*	*Examples*
S-9	SLO-1	*Energy level diagrams of diatomic-introduction*	*Electronic spectroscopy -Introduction*	*Electronic configurations, atomic and ionic sizes*	*Water chemistry*	*Cyclization*
	SLO-2	*Energy level diagrams of diatomic-explanation*	*Electronic spectroscopy-Explanation*	*Electronic configurations, atomic and ionic sizes*	*Water chemistry*	*Ring opening reactions*
S-10	SLO-1	*Tutorial Session*	*Tutorial Session*	*Tutorial Session*	*Tutorial Session*	*Tutorial Session*
	SLO-2	*Tutorial Session*	*Tutorial Session*	*Tutorial Session*	*Tutorial Session*	*Tutorial Session*
S 11-12	SLO-1 SLO-2	*Determine amount of sodium carbonate, sodium hydroxide in a mixture by titration*	*Determine strength of an acid using pH meter*	*Determine ferrous ion using potassium dichromate by potentiometric titration*	*Determine rate constant of Acid hydrolysis of an ester*	***Experiment - Repeat - 3***
S-13	SLO-1	*π-molecular orbitals of butadiene*	*Rotational spectroscopy of diatomic molecules*	*ionization energies, electron affinity and electronegativity*	*Corrosion*	*Synthesis of a commonly used drug molecule-Introduction*
	SLO-2	*π-molecular orbitals of benzene*	*Rotational spectroscopy of diatomic molecules*	*ionization energies, electron affinity and electronegativity*	*Corrosion*	*Synthesis of a commonly used drug molecule-Examples*
S-14	SLO-1	*Aromaticity-Introduction*	*Vibrational spectroscopy of diatomic molecules.*	*Polarizability, oxidationstates*	*Representations of 3 dimensional structures*	*Synthesis of a commonly used drug molecule-Introduction*
	SLO-2	*Aromaticity-explanation*	*Applications of vibrational and rotational spectroscopy of diatomic molecule*	*Polarizability, oxidationstates*	*structural isomers and stereoisomers*	*Synthesis of a commonly used drug molecule-Examples*
S-15	SLO-1	*Crystal field theory-Introduction*	*Nuclear magnetic resonance - Introduction*	*Coordination numbers and geometries*	*Configurations and symmetry and chirality*	*Question & Answer*
	SLO-2	*Crystal field theory-Introduction*	*Nuclear magnetic resonance - Explanation*	*Coordination numbers and geometries*	*enantiomers, diastereomers*	*Question & Answer*
S-16	SLO-1	*Tutorial Session*	*Tutorial Session*	*Tutorial Session*	*Tutorial Session*	*Tutorial Session*
	SLO-2	*Tutorial Session*	*Tutorial Session*	*Tutorial Session*	*Tutorial Session*	*Tutorial Session*
S 17-18	SLO-1 SLO-2	*Determine hardness (Ca^{2+}) of water using EDTA – complexometry method*	*Determine strength of an acid by conductometry*	*Determine molecular weight of a polymer by viscosity average method*	***Experiment - Repeat - 1***	*Demonstration Practical Session*

Learning Resources	*1. B. H. Mahan, R. J. Meyers, University Chemistry, 4th ed., Pearson publishers, 2009.* *2. M. J. Sienko, R. A. Plane, Chemistry: Principles and Applications, 3rd ed., McGraw-Hill publishers, 1980* *3. C. N. Banwell, Fundamentals of Molecular Spectroscopy, 5th ed., McGraw-Hill publishers, 2013*	*4.B. L. Tembe, Kamaluddin, M. S. Krishnan, Engineering Chemistry (NPTEL Web-book) http://nptel.ac.in/downloads/122101001/* *5. Peter W. Atkins, Julio de Paula, James Keeler,Physical Chemistry, 11th ed., Oxford publishers, 2018* *6. K. P. C. Vollhardt, N. E. Schore, Organic Chemistry: Structure and Function 7thed., Freeman, 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 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
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Course Code	18MAB101T	Course Name	CALCULUS AND LINEAR ALGEBRA	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)

		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
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Application of Matrices in problems of Science and Engineering																		
CLR-2 :	Utilize Taylor series, Maxima minima, composite function and Jacobian in solving rea- time application problems																		
CLR-3 :	Apply the concept of Differential Equations in problems of Science and Engineering																		
CLR-4 :	Utilize the concepts of radius of curvature, evolute, envelope in problems of Science and Engineering																		
CLR-5 :	Application of Sequences and Series in all problems involving Science and Engineering																		
CLR-6 :	Utilize appropriate mathematical techniques for the different solutions required in Science and Engineering applications																		
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																		
CLO-1 :	Apply Matrices, Eigenvalues and Eigen Vectors Reduce to Quadratics form in Science and Engineering problem solving	2	80	80	H	-	H	-	-	-	-	-	H	-	-	H	-	-	-
CLO-2 :	Apply Maxima and Minima, Jacobian, and Taylor series to solve problems in Science and Engineering	2	85	80	H	-	-	H	H	-	-	-	-	-	-	-	-	-	-
CLO-3 :	Solve the different types of Differential Equations in Science and Engineering applications	2	85	80	-	H	-		-	-	-	-	H	-	-	H	-	-	-
CLO-4 :	Identify Radius, Centre, envelope and Circle of of curvature and apply them in the problem solving	2	90	90	H	H	-	H	-	-	-	-	H	-	-	H	-	-	-
CLO-5 :	Apply convergence and divergence of series using different test and apply sequences and Series in the problem solving	2	90	80	-	H	H	-	-	-	-	-	H	-	-	H	-	-	-
CLO-6 :	Identify, Analyze and Apply mathematical techniques to arrive at solutions in Science and Engineering	2	90	90	H		H	-	-	-	-	-	H	-	-	H	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Characteristic equation	Functions of two variables – Partial derivatives	Linear equations of second order with constant coefficients when PI=0 or exp.	Radius of Curvature – Cartesian coordinates	Series of Positive terms – Test of Convergence-
	SLO-2	Eigen values of a real matrix	Total differential	Linear equations of second order with constant coefficients when PI=sinx or cosx	Radius of Curvature – Cartesian coordinates	Comparison test – Integral test-
S-2	SLO-1	Eigen vectors of a real matrix	Total differential	Linear equations of second order with constant coefficients when PI=polynomial	Radius of Curvature – Polar coordinates	Comparison test – Integral test-
	SLO-2	Eigen vectors of a real matrix	Taylor's expansion with two variables up to second order terms	Linear eqn. of second order with constant coefficients when PI=exp. with sinx / Cosx	Radius of Curvature – Polar coordinates	Comparison test – Integral test-.
S-3	SLO-1	Properties of Eigen values	Taylor's expansion with two variables up to third order terms	Linear eqn. of second order with constant coefficients when PI= exp.I with polynomial	Circle of curvature	D'Alemberts Ratio test,
	SLO-2	Cayley – Hamilton theorem	Maxima and Minima	Linear eqn. of 2nd order with const. coeff. when PI=polynomial with sinax or cosax	Circle of curvature	D'Alemberts Ratio test,
S-4	SLO-1	Problem solving using tutorial sheet 1	Problem solving using tutorial sheet 4	Problem solving using tutorial sheet 6	Problem solving using tutorial sheet 11	Problem solving using tutorial sheet 14
	SLO-2	Problem solving using tutorial sheet 1	Problem solving using tutorial sheet 4	Problem solving using tutorial sheet 6	Applications of Radius of curvature in engineering	Problem solving using tutorial sheet 14
S-5	SLO-1	Finding A inverse using Cayley – Hamilton theorem	Maxima and Minima	Linear equations of second order variable coefficients	Centre of curvature	Raabe's root test.

	SLO-2	*Finging higher powers of A using Cayley – Hamilton theorem*	*Maxima and Minima*	*Linear equations of second order variable coefficients*	*Centre of curvature*	*Raabe's root test.*
S-6	**SLO-1**	*orthogonal reduction of a symmetric matrix to diagonal form*	*Maxima and Minima*	*Homogeneous equation of Euler type*	*Centre of curvature*	*Covergent of Exponential Series*
	SLO-2	*orthogonal reduction of a symmetric matrix to diagonal form*	*Constrained Maxima and Minima by Lagrangian Multiplier method*	*Homogeneous equation of Legendre's Type*	*Evolute of a parabola*	*Cauchy's Root test*
S-7	**SLO-1**	*orthogonal reduction of a symmetric matrix to diagonal form*	*Constrained Maxima and Minima by Lagrangian Multipliermethod*	*Homogeneous equation of Legendre's Type*	*Evolute of an ellipse*	*Log test*
	SLO-2	*orthogonal reduction of a symmetric matrix to diagonal form*	*Constrained Maxima and Minima by Lagrangian Multipliermethod*	*Equations reducible to homogeneous form*	*Envelope of standard curves*	*Log test*
S-8	**SLO-1**	*Problem solving using tutorial sheet 2*	*Problem solving using tutorial sheet 5*	*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 2*	*Problem solving using tutorial sheet 5*	*Problem solving using tutorial sheet 9*	*Applications of Curvature in engineering*	*Problem solving using tutorial sheet 15*
S-9	**SLO-1**	*Reduction of Quadratic form to canonical*	*Jacobians of two Variables*	*Equations reducible to homogeneous form*	*Beta Gamma Functions*	*Alternating Series: Leibnitz test*
	SLO-2	*Quadratic form to canonical form by orthogonal transformations*	*Jacobians of Three variables*	*Variation of parameters*	*Beta Gamma Functions and Their Properties*	*Alternating Series: Leibnitz test*
S-10	SLO-1	*Quadratic form to canonical form by orthogonal transformations*	*Jacobians problems*	*Variation of parameters*	*Sequences – Definition and Examples*	*Series of positive and Negative terms.*
	SLO-2	*Orthogonal matrices*	*Jacobians Problems*	*Simultaneous first order equations with constant co-efficient.*	*Series – Types of Convergence*	*Series of positive and Negative terms.*
S-11	SLO-1	*Reduction of quadratic form to canonical form*	*Properties of Jacobians and Problems*	*Simultaneous first order equations with constant co-efficient.*	*Series of Positive terms – Test of Convergence-*	*Absolute Convergence*
	SLO-2	*Reduction of quadratic form to canonical form*	*Properties of Jacobians and problems*	*Simultaneous first order equations with constant co-efficient.*	*Comparison test – Integral test-*	*Conditional Convergence*
S-12	SLO-1	*Problem solving using tutorial sheet 3*	*Application of Taylor's series Maxima Minima Jacobians in Engineering*	*Problem solving using tutorial sheet 10*	*Problem solving using tutorial sheet 13*	*Problem solving using tutorial sheet 13*
	SLO-2	*Applications of Matrices in Engineering*	*Application of Taylor's series Maxima Minima Jacobians in Engineering*	*Applications of Differential Equation in engineering*	*Problem solving using tutorial sheet 13*	*Applications Convergence of series in engineering*

Learning Resources	***1. B. H.*** *Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006.* *2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.* *3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi,2008*	*4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010* *5. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson,Reprint, 2002* *6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008*

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
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Course Code	18MAB102T	Course Name	ADVANCED CALCULUS AND COMPLEX ANALYSIS	Course Category	B	Basic Sciences	L	T	P	C
							3	1	0	4

Pre-requisite Courses		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		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Evaluate Double and triple Integral and apply them in problems in Engineering Industries		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 :	Evaluate Surface, Volume Integral are Application of Gauss theorem, Stokes and Green's theorem in Engineering fields																				
CLR-3 :	Transform engineering problems into ODE, PDE and Integrals and solve them using Laplace / complex analytic methods																				
CLR-4 :	To know the properties of Complex functions and apply them in the all Engineering fields																				
CLR-5 :	Evaluate improper integrals involving complex functions using Residue theorem and apply them in Engineering fields																				
CLR-6 :	Identify how Engineering problems can be transformed in to simple mathematical constructs and solve the same																				
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																				
CLO-1 :	Evaluate multiple integrals using change of variables		3	95	90		H	-	H	-	-	-	-	-	H	-	-	H	-	-	-
CLO-2 :	Apply techniques of vector calculus in problems involving Science and Engineering. Solving Ordinary Differential Equations		3	90	85		H	-	-	H	H	-	-	-	-	-	-	-	-	-	-
CLO-3 :	Apply techniques of Laplace Transforms and inverse transform for problems in Science and Engineering		2	85	80		-	H	-		-	-	-	-	H	-	-	H	-	-	-
CLO-4 :	Apply complex analytic functions and its properties in solving problems		3	80	80		H	H	-	H	-	-	-	-	H	-	-	H	-	-	-
CLO-5 :	Evaluate improper integrals using Residue theorem involving problems in Science and Engineering		2	80	90		-	H	H	-	-	-	-	-	H	-	-	H	-	-	-
CLO-6 :	Create mathematical constructs for engineering problems and identify solutions to solve them		3	90	80		H		H	-	-	-	-	-	H	-	-	H	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Evaluation of double integration Cartesian and plane polar coordinates	Review of vectors in 2,3 dimensions	Laplace Transforms of standard functions	Definition of Analytic Function – Cauchy Riemann equations	Cauchy's integral formulae - Problems
	SLO-2	Evaluation of double integration of plane polar coordinates	Gradient, divergence,	Transforms properties	Cauchy Riemann equations	Cauchy's integral formulae- Problems
S-2	SLO-1	Evaluation of double integration of plane polar coordinates	curl – Solenoidal	Transforms of Derivatives and Integrals	Properties of analytic function functions	Cauchy's integral formulae- Problems
	SLO-2	Evaluation of double integration of plane polar coordinates	Irrotational fields	Transform of derivatives and integrals	Determination of analytic function using – Milne-Thomson's method	Taylor's expansions with simple problems
S-3	SLO-1	Evaluation of double integral by changing of order of integration	Vector identities (without proof) – Directional derivatives	Initial value theorems (without proof) and verification for some problems	Determination of analytic function using – Milne-Thomson's method	Taylor's expansions with simple problems
	SLO-2	Evaluation of double integral by changing of order of integration	Line integrals	Final value theorems (without proof) and verification for some problems	Determination of analytic function using – Milne-Thomson's method	Laurent's expansions with simple 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	Evaluation of double integral by changing of order of integration	Line integrals	Inverse Laplace transforms using partial fractions	Conformal mappings: magnification	Laurent's expansions with simple problems

	SLO-2	*Area as a double integral (Cartesian)*	*Surface integrals*	*Inverse Laplace transforms using Partial fractions*	*Conformal mappings: rotation*	*Singularities*
S-6	**SLO-1**	*Area as a double integral (Cartesian)*	*Surface integrals*	*Inverse Laplace transforms using second shifting theorem*	*Conformal mappings: inversion*	*Types of Poles and Residues*
	SLO-2	*Area as a double integral (polar)*	*Volume Integrals*	*LT using Convolution theorem - problems only*	*Conformal mappings: inversion*	*Types of Poles and Residues*
S-7	**SLO-1**	*Area as a double integral (polar)*	*Green's theorem (without proof),*	*LT using Convolution theorem - problems only*	*Conformal mappings: reflection*	*Cauchy's residue theorem (without proof)-*
	SLO-2	*Triple integration in Cartesian coordinates*	*Green's theorem (without proof),*	*ILT using Convolution theorem - problems only*	*Conformal mappings: reflection*	*Contour integration: Unit circle.*
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**	*Conversion from Cartesian to polar in double integrals*	*Gauss divergence theorem (without proof), verification*	*LT of periodic functions -problems only*	*bilinear transformation*	*Contour integration: Unit circle.*
	SLO-2	*Conversion from Cartesian to polar in double integrals*	*Gauss divergence theorem (without proof) applications to cubes.*	*LT of periodic functions -problems only*	*bilinear transformation*	*Contour integration: Unit circle*
S-10	SLO-1	*Triple integration in Cartesian coordinates*	*Gauss divergence theorem (without proof applications to parallelepiped.*	*Solve linear second order ordinary diff. equations with constant coefficient only*	*bilinear transformation*	*Contour integration: semicircular contour.*
	SLO-2	*Triple integration in Cartesian coordinates*	*Stoke's theorems (without proof) – Verification*	*Solve linear second order ordinary diff. equations with constant coefficient only*	*bilinear transformation*	*Contour integration: semicircular contour.*
S-11	SLO-1	*Triple integration in Cartesian coordinates*	*Stoke's theorems (without proof) – Applications to cubes*	*Solution of Integral equation and integral equation involving convolution type*	*Cauchy's integral theorem (without proof)*	*Contour integration: semicircular contour.*
	SLO-2	*Volume using triple Integral*	*Stoke's theorems (without proof) – Applications to parallelepiped only.*	*Solution of Integral equation and integral equation involving convolution type*	*Cauchy's integral theorem applications*	*Contour integration: semicircular contour.*
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	*Application of Multiple integral in engineering*	*Application of Line and Volume Integrals in engineering*	*Application of Laplace Transform in engineering*	*Application of Bilinear Transformation and Cauchy Integral in engineering*	*Application **Contour integration** in engineering*

Learning Resources	***1. B. H.** Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006.* *2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.* *3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi,2008*	*4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010* *5. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson,Reprint, 2002* *6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008*

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
1. Mr.V.Maheshwaran, CTS, Chennai, maheshwaranv@yahoo.com	*1. Dr. K. C. Sivakumar, IIT, Madras, kcskumar@iitm.ac.in*	*1. Dr. A. Govindarajan, SRMIST*
2. Dr. Sricharan Srinivasan, Wipro Technologies, sricharanms@gmail.com	*2. Dr. Nanjundan, Bangalore University, nanzundan@gmail.com*	*2. Dr. Srinivasan, SRMIST*

Course Code	18MAB201T	Course Name	TRANSFORMS AND BOUNDARY VALUE PROBLEMS	Course Category	B	Basic Sciences	L	T	P	C
							3	1	0	4

Pre-requisite Courses	18MAB102T	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)															
		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 :	Describe types of Partial differential equations interpret solutions relate PDE to the respective branches of engineering	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
CLR-2 :	Relate Fourier series expansion in solving problems under RMS value and Harmonic Analysis.																			
CLR-3 :	Infer the most general form to the PDE and relate to half range sine and cosine series, as the case may be																			
CLR-4 :	Evaluate the various types of integral transforms																			
CLR-5 :	Conclude that the purpose of studying z transform is to solve linear difference equations having constant coefficients																			
CLR-6 :	Predicting the importance of PDE, Fourier series, Boundary value problems and Fourier ,Z – transform applications																			
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																			
CLO-1 :	Determine Partial differential equation	2	85	80	M	H	L	-	-	-	-	-	M	-	-	H	-	-	-	
CLO-2 :	Explain the expansion of a discontinuous function as an infinite form of trigonometric sine and cosine series.	2	85	80	M	H	-	M	M	-	-	-	M	L	-	H	-	-	-	
CLO-3 :	Decide a proper form of solution for the differential equations which are of hyperbolic and parabolic type	2	85	80	M	H	-	-	-	-	-	-	M	-	-	H	-	-	-	
CLO-4 :	justify the relationship between aperiodic signals and linear combination of exponentials.	2	85	80	M	H	-	M	-	-	-	-	M	L	-	H	-	-	-	
CLO-5 :	Relate signal analysis with that of z transform	2	85	80	M	H	L	-	-	-	-	-	M	-	-	H	-	-	-	
CLO-6 :	Relate PDE, Fourier series, Boundary value problems, Fourier and Z transforms	2	85	80	L	L	L	H	H	H	L	H	H	H	-	H	-	-	-	

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Formation of partial differential equation by eliminating arbitrary constants	Introduction of Fourier series - Dirichlet's conditions for existence of Fourier Series	Classification of second order partial differential equations	Introduction of Fourier Transforms	Introduction of Z-transform
	SLO-2	Formation of partial differential equation by eliminating two or more arbitrary constants	Fourier series –related problems in $(0,2\pi)$	Method of separation of variables	Fourier Transforms- problems	Z-transform-elementary properties
S-2	SLO-1	Formation of partial differential equation by eliminating arbitrary functions	Fourier series –related problems in$(-\pi,\pi)$	One dimensional Wave Equation and its possible solutions	Properties of Fourier transforms	Z-transform- change of scale property, shifting property
	SLO-2	Formation of partial differential equation by eliminating two or more arbitrary functions	Change of interval Fourier series –related problems in $(0,2l)$	One dimensional Wave Equation-initial displacement with zero initial velocity-type 1 Algebraic function	Standard results of Fourier transform	Z-transform of $a^n, \frac{1}{n}, \frac{1}{n+1}$
S-3	SLO-1	Formation of partial differential equation by eliminating arbitrary functions of the form$\phi(u,v)=0$	Fourier series –related problems in $(-l,l)$	One dimensional Wave Equation-initial displacement with zero initial velocity-type 2 Trigonometric function	Fourier Sine Transforms - problems	Z-transform of $\frac{1}{n^2}, \frac{1}{(n+1)^2}$
	SLO-2	Solution of first order non-linear partial differential equations-standard type I F(p,q)=0	Fourier series –half range cosine series related problems$(0,\pi)$	One dimensional Wave Equation-initial displacement with zero initial velocity-type 3 – Midpoint of the string is displaced	Fourier Cosine Transforms - problems	Z-transform of $r^n \cos n\theta$
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					

S-5	**SLO-1**	*Solution of first order nonlinear partial differential equations-standard type –II Clairaut's form*	*Fourier series –half range cosine series related problems* $(0, l)$	*One dimensional Wave Equation-initial displacement with non-zero initial velocity Type 1 Algebraic function*	*Properties of Fourier sine Transforms*	*Z-transform of* $r^n \sin n\theta$
	SLO-2	*Solution of first order non-linear partial differential equations-standard type III F(z, p, q)=0*	*Fourier series –half range sine series related problems* $(0, \pi)$	*One dimensional Wave Equation-initial displacement with non-zero initial velocity Type 2 Trigonometric function*	*Fourier sine Transforms applications*	*Initial value theorem*
S-6	**SLO-1**	*Solution of first order non-linear partial differential equations-standard type-IV separation of variable f(x, p) = g(y, q)*	*Fourier series –half range sine series related problems* $(0, l)$	*Wave Equation-initial displacement with non-zero initial velocity Type 3 split function*	*Properties of Fourier cosine Transforms*	*Finial value theorem*
	SLO-2	*Lagrange's linear equation: Method of grouping*	*Parseval's Theorem(without proof)-related problems in Fourier series*	*One dimensional heat equation and its possible solutions*	*Fourier cosine Transforms applications*	*Inverse Z-transform- long division method*
S-7	**SLO-1**	*Lagrange's linear equation: Method of multipliers*	*Parseval's Theorem(without proof)-related problems in cosine series*	*One dimensional heat equation related problems*	*Convolution of two function*	*Inverse Z-transform, related problems, long division method*
	SLO-2	*More problems in Lagrange's linear equation: Method of multipliers*	*Parseval's Theorem (without proof)-related problems in sine series*	*One dimensional heat equation -Steady state conditions*	*Convolution Theorem*	*Inverse Z-transform, Partial fraction method*
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					
S-9	**SLO-1**	*Linear Homogeneous partial differential equations of second and higher order with constant coefficients-CF and PI Type 1:* e^{ax+by}	*Introduction to Harmonic Analysis*	*One dimensional heat equation -Steady state conditions more problems*	*Parseval's Identity for Fourier transform*	*Inverse Z-transform, Partial fraction method related problems*
	SLO-2	*PI Type2.:**sin(ax+by) or cos(ax+by)***	*Harmonic Analysis for finding harmonic in* $(0,2\pi)$	*One dimensional heat equation -Steady state conditions with zero velocity*	*Parseval's Identity for Fourier sine & cosine transforms*	*Inverse Z-transform - residue theorem method*
S-10	SLO-1	*Type 3: PI of polynomial*	*Harmonic Analysis for finding harmonic in* $(0,2l)$	*One dimensional heat equation -Steady state conditions with zero velocity more problems*	*Parseval's Identity for Fourier sine & cosine transforms applications*	*Inverse Z-transform - residue theorem method-problems*
	SLO-2	*Type 4 Exponential shifting* $e^{ax+by}f(x, y)$	*Harmonic Analysis for finding harmonic in periodic interval* $(0, T)$	*One dimensional heat equation -Steady state conditions with zero velocity more related problems*	*Fourier Transforms Using Differentiation property*	*Convolution theorem (without proof)*
S-11	SLO-1	*Linear Homogeneous partial differential equations of second and higher order with constant coefficients type 5 General rule*	*Harmonic Analysis for finding cosine series*	*Steady state conditions and Non-zero boundary conditions- related problems*	*Solving integral equation*	*Convolution theorem applications*
	SLO-2	*Applications of Partial differential equations in Engineering*	*Harmonic Analysis for finding sine series*	*Steady state conditions and Non-zero boundary conditions- more problems*	*Self-reciprocal using Fourier Transform, sine and cosine transform*	*Solution of linear difference equations with constant coefficients using Z-transform*
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	*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*

Learning Resources	***1. B. H.** Erwin kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons,2006* *2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2015* *3. Veerarajan T., Transforms and Partial Differential Equations, Tata McGraw-Hill, New Delhi,2012*	*4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 3rd Edition, 2010* *6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, for third semester, Laxmi Publications, 3rd Edition, 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	*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.,

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Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
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Course Code	18MAB204T	Course Name	PROBABILITY AND QUEUEING THEORY	Course Category	B	Basic Sciences	L	T	P	C
							3	1	0	4

Pre-requisite Courses	18MAB102T	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)														
CLR-1 :	Apply and evaluating probability using random variables	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	Gain the knowledge and acquire the application of distribution to find the probability using Theoretical distributions	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design,	Modern Tool Usage	Society & Culture	Environment &	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLR-3 :	To Assess the appropriate model and apply and soling any realistic problem situation to determine the probability																		
CLR-4 :	To interpret the decision using Markov queueing applications																		
CLR-5 :	To construct chain of decisions from the past situations using Monrovians																		
CLR-6 :	Interpret random variables and Queuing theory in engineering problems.																		
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																		
CLO-1 :	Solving problems on Discrete and Continuous Random variables	3	85	80	M	H	L	-	-	-	-	-	M	-	-	H	-	-	-
CLO-2 :	Identifying Distribution and solving the problems in Discrete and Continuous Distribution	3	85	80	M	H		M	M	-	-	-	M	L	-	H	-	-	-
CLO-3 :	Decision Models using sampling techniques in Large and Small samples	3	85	80	M	H	-	-	-	-	-	-	M	-	-	H	-	-	-
CLO-4 :	Solving Queuing problems using Kendall's notation	3	85	80	M	H	-	-	-	-	-	-	M	L	-	H	-	-	-
CLO-5 :	To Evaluate the probability in uncertain situations using Markov chain rule	3	85	80	M	H	L	M	-	-	-	-	M	-	-	H	-	-	-
CLO-6 :	Solving and analyzing the problems in random variables and Queuing theory.	3	85	80	M	H	-	-	-	-	-	-	M	-	-	H	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Probability Basic concepts and Axioms	Discrete Probability distribution	Sampling distribution, Null Hypothesis, Alternate Hypothesis	Introduction to F-test	Markov Process and Introduction of a Markov Chain
	SLO-2	Conditional probability, Multiplication theorem	Introduction to Binomial distribution	One tailed test, two tailed test	Problems on F-test	Past and Future - Step and State
S-2	SLO-1	Discrete and continuous Random variables	MGF, Mean, Variance of Binomial distribution	Level of significance, Critical region	Chi square test -Goodness of fit	One step Transition Probability N step transition Probability
	SLO-2	Probability mass function, cdf	Applications of Binomial distribution	Large samples test	Problems on Chi square test -Goodness of fit	Chapman-kolmogorov theorem definition
S-3	SLO-1	Continuous Random variables	Fit a Binomial distribution.	Student - t test Single Proportion	Problems on Chi-square test Independent-Attributes	Initial Probability distribution problems Using Markov Chain
	SLO-2	pdf and cdf applications	Introduction to Poisson Distribution	Two Sample proportions	Problems on Chi-square test Independent-Attributes with standard distributions	Initial Probability distribution problems Using Markov Chain
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					
S-5	SLO-1	Expectation and Variance	MGF , Mean , Variance of Poisson distribution	Large sample test- Single Mean	Introduction to Queueing Theory and Applications. Kendall, notation	Classification of States of a Markov Chain
	SLO-2	Problems on Expectation and Variance	Applications of Poisson Distribution	Difference of Means	Introduction to M/M/1 : infinity/ FIFO	Irreducible, Non irreducible, a period, Persistent, Non null Persistent
S-6	SLO-1	Moment Generating Function	Fit a Poisson Distribution	Problems on difference of Means	Ls, Lq, Ws,Wq	Problems on Classification of a Markov Chain
	SLO-2	Problems on MGF	Introduction , MGF Mean, Variance of Geometric distribution	Applications of Difference of Means	M/M/1 :Infinity /FIFO problems	Problem on Classification of a Markov Chain

S-7	**SLO-1**	*Functions of Random variables*	*Applications of Geometric Distribution, problems on Memory less property*	*Introduction to small samples*	*M/M/1 :Infinity /FIFO problems*	*Classification of states of a Markov Chain*
	SLO-2	*Problems on Functions of Random variable*	*Introduction , MGF, Mean, Variance of Uniform Distribution*	*Introduction to small Samples*	*M/M/1 :Infinity /FIFO problems*	*Stationary and steady state*
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					
S-9	**SLO-1**	*Tchebycheffs inequality*	*Applications of Uniform Distribution problems*	*Problems on single mean -small samples*	*Single Server Model with Finite System Capacity, Characteristics of the Model (M/M/1) : (K/FIFO)*	*Problems on Classification-State-stationary using Markov Chain*
	SLO-2	*Introduction to theoretical distribution*	*Introduction , MGF, Mean, Variance of Exponential distribution*	*Problems on single mean -small samples*	*Effective arrival rate*	*Problems on Stationary and steady state*
S-10	SLO-1	*Formula and application of Tchebycheffs inequality*	*Applications of Exponential distribution problems*	*Problems on difference of mean-small samples*	*Problems on Model (M/M/1) : (K/FIFO)*	*Problems on Ergodicity using Markov Chain*
	SLO-2	*Applications of chebychevs inequality*	*Introduction to Normal distribution*	*Problems on difference of mean-small samples*	*Problems on Model (M/M/1) : (K/FIFO)*	*Problems on Ergodicity using Markov Chain*
S-11	SLO-1	*Applications of chebychevs inequality using distribution*	*Applications of Normal distribution problems*	*Applications of paired - t test*	*Problems on Model (M/M/1) : (K/FIFO)*	*Problems on Ergodicity*
	SLO-2	*Problems practice using* ***chebychevs inequality***	*Practical applications of Normal distribution*	*Problems of paired - t test.*	*Problems on Model (M/M/1) : (K/FIFO)*	*Problems on Ergodic and Non Ergodic Using Markovchains*
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 random variables in engineering*	*Applications of distribution to find the probability using Theoretical distributions*	*Applications of solving any realistic problem situation to determine the probability*	*Applications of Queueing decision models*	*Applications of constructing chain of decisions from the past situations using Monrovians*

Learning Resources	1. *Veerarajan T, Probability , Statistics and Random Processes, Tata Mc.Graw Hill, 1st Reprint 2004* 2. *S.C. Gupta, V.K.Kapoor, Fundamentals of Mathematical Statistics, 9th ed.,, Sultan Chand & Sons, 1999* 3. *Gross. D and Harri.C.M. Fundamentals of Queuing theory, John Wiley and Sons, 1985*	4. *Trivedi K S, Probability and Statistics with reliability, Queueing and Computer Science Applications, prentice Hall of India, New Delhi, 1984* 5. *Allen .A.O. , Probability Statistics and Queueing theory, Academic 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	*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.,

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Course Code	18MAB302T	Course Name	DISCRTE MATHEMATICS FOR ENGINEERS	Course Category	BS	Basic Sciences	L	T	P	C
							3	1	0	4

Pre-requisite Courses	18MAB101T	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:
CLR-1 :	Apply set theory, functions and relations in storage, communication and manipulation of data
CLR-2 :	Apply number theory concepts in computer engineering such as public key crypto system.
CLR-3 :	Apply mathematical reasoning in computer science such as design of computer circuit, verification of programs.
CLR-4 :	Learning about groups, rings and fields. Solving problems on coding theory.
CLR-5 :	Using graph models in computer network and shortest path problems Apply graph coloring in problems involving scheduling and assignments.
CLR-6 :	Apply mathematical reasoning, combinatorial analysis, algebraic structures and graph theory in solving mathematical problems as applied to the respective branches of Engineering.

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 4 Design & Development 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 :	Problem solving in sets, relations and functions.	3	85	80	M	H	L					M	L		H			
CLO-2 :	Solving problems in basic counting principles, inclusion exclusion and number theory.	3	85	80	M	H	M	M				M			H			
CLO-3 :	Solving problems of mathematical logic, inference theory and mathematical induction.	3	85	80	M	H						M			H			
CLO-4 :	Gaining knowledge in groups, rings and fields. Solving problems in coding theory.	3	85	80	M	H	M					M			H			
CLO-5 :	Gaining knowledge in graphs and properties. Learning about trees, minimum spanning trees and graph coloring.	3	85	80	M	H	L					M	L		H			
CLO-6 :	Learning mathematical reasoning, combinatorial analysis, algebraic structures and graph theory.	3	85	80	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	Sets and examples. Operations on sets.	Permutation and Combination	Propositions and Logical operators	Binary operation on a set- Groups and axioms of groups.	Basic concepts - Basic Definitions- degree and Hand shaking theorem.
	SLO-2	Laws of Set theory- Proving set identities using laws of set theory.	Simple problems using addition and product rules.	Truth values and truth tables.	Properties of groups.	Some Special Graphs – complete, regular and bipartite graphs.
S-2	SLO-1	Partition of a set – examples.	Principle of inclusion and exclusion	Propositions generated by a set- Symbolic writing using conditional and biconditional connectives.	Permutation group, equivalence classes with addition modulo m and multiplication modulo m.	Isomorphism of graphs – necessary conditions.
	SLO-2	Cartesian product of sets.	Problems using inclusion and exclusion principle.	Writing converse inverse and contra positive of a given conditional.	Cyclic groups and properties.	Isomorphism- simple examples.
S-3	SLO-1	Relations – Properties.	Pigeon-hole principle and generalized pigeon-hole principle.	Tautology, contradiction and contingency-examples.	Subgroups and necessary and sufficiency of a subset to be a subgroup.	*Paths, cycles and circuits.*
	SLO-2	Equivalence relation and partial order relation	Problems on pigeon-hole principle.	Proving tautology and contradiction using truth table method.	Group homomorphism and properties.	*Connectivity in undirected graphs – connected graphs and odd degree vertices.*
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					
S-5	SLO-1	Poset - Graphs of relations Digraphs	Divisibility and prime numbers.	Equivalences – truth table method to prove equivalences.	Rings- definition and examples..Zero devisors.	Eulerian and Hamiltonian graphs.
	SLO-2	Hasse diagram – problems.	Fundamental theorem of arithmetic – problems.	Implications- truth table method to prove implications.	Integral domain- definition , examples and properties.	Necessary and sufficient condition for a graph to be Eulerian- examples.

S-6	**SLO-1**	*Closures of relations- examples*	Finding prime factorization of a given number.	Laws of logic and some equivalences.	Fields – definition, examples and properties.	Matrix representation of graphs- adjacent and incidence matrices and examples.
	SLO-2	Transitive closure and warshall's algorithm	Some more problems using fundamental theorem of arithmetic.	Proving equivalences and implications using laws of logic.	Coding Theory – Encoders and decoders- Hamming codes.	Isomorphism using adjacency.
S-7	**SLO-1**	Functions – definitions, domain and range of a function - examples	Division algorithm- greatest common divisor and properties- problems.	Rules of inference – Rule P, Rule T and Rule CP	Hamming distance. Error detected by an encoding function.	*Digraphs – in degree and out degree – Hand shaking theorem.*
	SLO-2	Types of functions- one- one and onto- bijection- examples.	Euclid's algorithm for finding GCD(a,b)- examples..	Direct proofs	examples.	*Verification of hand shaking theorem in digraphs.*
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					
S-9	**SLO-1**	Composition of functions – examples.	Problems using Euclid's algorithm.	*Problems using direct method.*	Error correction using matrices.	Graph colouring – chromatic number-examples.
	SLO-2	Associatiivity of composition of functions – Identity and inverse of functions.	Least common Multiple(LCM)- relation between LCM and GCD.	*Problems using CP rule.*	Problems on error correction using matrices.	Four colour theorem(statement only) and problems.
S-10	SLO-1	Necessary and sufficiency of existence of inverse of a function.	Problems on LCM.	Inconsistency and indirect method of proof.	Group codes-error correction in group codes-parity check matrix.	Trees – definitions and examples. Properties.
	SLO-2	Uniqueness of identity	Finding LCM and GCD using prime factorization.	Inconsistent premises and proof by contradiction (indirect method).	Problems on error correction in group codes.	Properties continued.
S-11	SLO-1	Inverse of composition	Finding GCD and LCM using Euclid's algorithm.	Principle of mathematical induction.	Procedure for decoding group codes.	Spanning trees – examples.
	SLO-2	Checking if a given function is bijection and if so, finding inverse, domain and range- problems.	More problems on GCD and LCM.	Problems based on Mathematical Induction	Problems on decoding group codes.	Kruskal's algorithm for minimum spanning trees.
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					

Learning Resources

1. Kenneth H.Rosen, Discrete Mathematics and its Application, Seventh edition, Tata McGraw-Hill Publishing company PVT .Ltd., New Delhi, 2012.
2. Tremblay J. P. and Manohar R., Discrete Mathematical Structures with applications to Computer Science, Tata Mc Graw Hill Publishing Co., 35th edition,2008.
3. Narsing Deo, Graph Theory with applications to Engineering and Computer science, Prentice-Hall of India pvt. Ltd., New Delhi, 2004.
4. C.L. Liu, Elements of Discrete Mathematics, 4th Edition, McGraw Higher ED, 2012.
5. T.Veerarajan, Discrete Mathematics with Graph Theory and Combinatorics, Tata McGraw Hill, 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	*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 %	

Course Designers

(a) Experts from Industry

1	*Mr.V.Maheshwaran*	*CTS, Chennai*	*maheshwaranv@yahoo.com*				

(b) Experts from Higher Technical Institutions

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(b) Internal Experts

4	*Dr.A.Govindarajan*	*SRMIST*	govindarajan.a@ktr.srmuniv.ac.in	5	*Dr.N. Parvathi*	*SRMIST*	*parvathn@srmist.edu.in*

Course Code	18BTB101T	Course Name	BIOLOGY	Course Category	B	Basic Sciences	L	T	P	C
							2	0	0	2

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	Recall the cell structure and function from its organization
CLR-2 :	Discuss molecular and biochemical basis of an organism
CLR-3 :	Compare enzyme reaction and photosynthesis
CLR-4 :	Explain different types of biosensors
CLR-5 :	Analyze the different types of bioremediation
CLR-6 :	Relate the concept of nervous and immune system pertaining to diseases

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 :	Describe the cell growth, metabolism and reproduction.	1	80	80	L	H	H	H	-	M	L	H	H	H	-	H	L	H	H
CLO-2 :	Explain the concepts and experiments in biochemistry	2	85	75	M	H	H	M	-	-	M	H	L	H	-	H	L	H	H
CLO-3 :	Recognize the significance of photosynthesis	2	75	80	M	H	M	H	M	M	-	M	H	H	-	H	L	H	H
CLO-4 :	Discuss the different methods in enzyme catalytic functions	2	85	80	L	H	H	H	-	-	H	L	L	H	-	H	M	H	H
CLO-5 :	Analyze the role of biosensors and its applications	3	85	75	L	H	H	M	-	M	H	H	H	L	-	H	H	H	H
CLO-6 :	Explain the concepts of nervous system disorder and the diseases associated with it	2	80	80	M	H	H	H	L	H	M	M	H	H	-	H	H	H	H

Duration (hour)		6	6	6	6	6
S-1	SLO-1	Basics of cell biology: Relevance to Engineers	Biochemistry: Macromolecules, ***Biodiversity and its importance***	Bioenergetics and metabolism	Molecular machines and motors	Nervous system:***History of neuroscience***
	SLO-2	Cell basic unit of life, Evidence for cell theory	Chemistry of life	Enzymes as biological catalysts, Significance of enzymes	Properties of ATP based protein molecular machines	Glial cells, Neurons
S-2	SLO-1	Cell structure and function	Biochemistry and human biology, DNA replication	Thermodynamics of enzymes	F0F1 ATP synthase motors, Coupling and coordination of motors	Action potential, Organization of nervous system
	SLO-2	Genetic Information, Protein structure	Transcription, Protein synthesis	Factors affecting enzyme activity, Effect of inhibitors on enzyme activity	Bacterial flagellar motor, Cytoskeleton	Central Nervous system, Peripheral nervous system
S-3	SLO-1	Cell metabolism	Eukaryotic and prokaryotic protein synthesis difference	Mechanism of enzyme action	Microtubules	Diseases of nervous system
	SLO-2	Carbohydrate metabolism, Fatty acid metabolism	Concept of genetic code, Stem cells	Enzyme strategies, Restriction enzymes	Microfilaments, Intermediate filaments	Computer- based neural networks
S-4	SLO-1	Homeostasis	Source of stem cells, Classification of stem cells	NMP kinases, Photosynthesis	Kinesin linear motor, Dynein motor	Immune system
	SLO-2	Pathways that alter homeostasis, Cell growth	Human embryonic stem cell, Importance and applications of stem cells	Light reactions, Photosystems	Biosensor	Fluid systems of the body, Innate immune system
S-5	SLO-1	Reproduction	Therapeutic cloning	ATP synthesis in chloroplasts	Resonant biosensors, Glucose biosensors	Cells of innate immune system, Adaptive immunity
	SLO-2	Eukaryotic cell division, Mitosis	Regenerative medicine	Calvin cycle	Bio detectors, Biosensor detection in pollutants	Diseases of immune system, Immune engineering
S-6	SLO-1	Meiosis, Cell differentiation	Bone tissue engineering	Significance of photosynthesis	Bioremediation	Cell signaling
	SLO-2	Neural crest	Gene therapy	Metabolism, Glycolysis	Bioventing and bio augmentation	Cell- surface receptors

Learning Resources	1. S.Thyagarajan, N.Selvamurugan, R.A.Nazeer et.al., Biology for engineers McGraw Hill Education. 2012	2. Norman Lewis, Gabi Nindl Waite, Lee R. Waite et.al., Applied Cell and Molecular Biology for Engineers. McGraw-Hill Education. 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	*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
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2. Dr. Karthik Periyasamy, Aurobindo Pharma Limited, Hyderabad, karthikmpk@gmail.com	*2. Dr. R. B. Narayanan, SVCE Chennai, rbn@svce.ac.in*	*Dr.S.Barathi, SRMIST*

Course Code	18MES101L	Course Name	ENGINEERING GRAPHICS AND DESIGN	Course Category	S	*Engineering Sciences*	L	T	P	C
							1	0	4	3

Pre-requisite Courses	*Nil*	**Co-requisite Courses**	*Nil*	**Progressive Courses**	*Nil*
Course Offering Department	*Mechanical 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 engineering graphic fundamentals. apply the same to draw/evaluate engineering curves and projection of objects*			
CLR-2 :	*Draw projection of solid objects like prisms, cylinders, pyramids and cones used in various engineering objects*			
CLR-3 :	*Draw the projection of combination of solids, and section of solids. Create building plans for construction*			
CLR-4 :	*Create 3D part models. Develop its surfaces using solid-modeling software for effectiveness, clarity, accuracy, portability*			
CLR-5 :	*Evaluate the assembly of engineering component parts. Create 2D drawings for assembly of engineering components*			
CLR-6 :	*Draw, Create, Evaluate, Interpret engineering 2D and 3D surfaces of engineering components using modeling software*			

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	1	2	3	**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 - I	14 PSO - II	15 PSO – III
CLO-1 :	*Identify engineering graphics. Draw objects like points, lines, planes, and solids in perspective & orthographic projections*	*3*	*90*	*85*	*H*	*H*	*L*	*L*	*L*	*H*	*L*	*H*	*L*	*H*	*L*	*L*	*L*	*L*	*L*
CLO-2 :	*Draw projection of solids like prism, cylinder, pyramid and cone inclined in general positions, obtain auxiliary views*	*2*	*95*	*90*	*M*	*M*	*L*	*L*	*M*	*H*	*H*	*L*	*L*	*H*	*L*	*L*	*L*	*L*	*L*
CLO-3 :	*Draw projection of combination of solids made out of primitives, draw the section of solids, create building plans*	*3*	*90*	*85*	*H*	*H*	*M*	*M*	*H*	*H*	*H*	*H*	*M*	*H*	*L*	*H*	*L*	*L*	*L*
CLO-4 :	*Create 3D part models. Develop its surfaces with solid modeling software for effectiveness, clarity, accuracy, portability*	*3*	*90*	*85*	*H*	*H*	*H*	*H*	*H*	*H*	*H*	*L*	*H*	*H*	*L*	*H*	***M***	*L*	***M***
CLO-5 :	*Evaluate the assembly of parts including interference of parts. Create 2D drawings of assembly of parts*	*3*	*85*	*80*	*H*	*H*	*M*	*H*	*H*	*H*	*H*	*H*	*L*	*H*	*L*	*H*	*L*	***M***	*L*
CLO-6 :	*Draw graphics of engineering pans with point, line, plane, solids, in perspective and orthographic projections*	*2*	*90*	*85*	*M*	*M*	*L*	*M*	*L*	*L*	*L*	*H*	*L*	*L*	*L*	*L*	*L*	*L*	*L*

		Engineering graphics and Projection	*Projection of solids using CAD software*	*Projections of combination of solids*	*Part Modeling and Drawing*	*Assembly Modeling and Drawing*
Duration (hour)		**15**	**15**	**15**	**15**	**15**
S-1	**SLO-1**	*Principles, Standards, Conventions*	*Introducing CAD Software, layers, dimensions, tolerance, annotations*	*Combinations of solids, Constructive Solid Geometry(CSG), Boolean operations*	*3D modelling, parametric, non- parametric, parts of CSG, surface, wireframe, shaded*	*Part/ component model creation for assembly.*
	SLO-2	*Angle Projection, Symbols, Dimensions*	*Create, modify, customize, print using CAD*	*Creating combination of solids, isometric, perspective views, shaded, wire-frame*	*Rendered models, background, shadows, multi-view, isometric, perspective views*	*Study of various widely used assembly of parts like flanged joint, universal joint etc.*
S-2	**SLO-1**	*2D Geometric Constructions*	*Demo: Menu, Toolbars, Drawing Area, Dialog box, windows, Shortcut menus*	*Constructive Solid Geometry, Boolean operations, Creating combination of solids*	*3D modelling, parametric, non- parametric, parts of CSG, surface, wireframe, shaded*	*Creation of parametric parts for assembly*
	SLO-2	*2D Geometric Constructions*	*Command Line, Status Bar, Different zoom methods, Create, Select, Erase objects*	*isometric, perspective, shaded, wire-frame*	*Rendered models, background, shadows, multi-view, isometric, perspective views*	*non- parametric parts for assembly*
S-3	**SLO-1**	*Conic Curves ellipse by eccentricity method*	*Draw straight lines, rectangle, polar, absolute, relative*	*Constructive Solid Geometry, Boolean operations, Creating combination of solids*	*Viewing models in multi-view, isometric, and perspective views*	*Creation of parametric parts for assembly*
	SLO-2	*Conic Curves ellipse by eccentricity method*	*Orthographic constraints, Ortho ON, snap to objects manually, automatically drawing lines, arcs, circles, polygons, create, edit, use layers, extend lines*	*isometric, perspective, shaded, wire-frame*	*Viewing models in multi-view, isometric, and perspective views*	*non- parametric parts for assembly*
S-4	**SLO-1**	*Cycloids, Epicycloids*		*Constructive Solid Geometry, Boolean operations, Creating combination of solids*	*Modelling industrial part drawings*	*Creation of parametric parts for assembly*
	SLO-2	*Hypocycloid*	*Dimensioning objects, annotations*	*isometric, perspective, shaded, wire-frame*	*Modelling industrial part drawings*	*non- parametric parts for assembly*
S-5	**SLO-1**	*Involute of a Square, Circle*	*Demo: drawing page, print, units/ scale/ limits settings, standards for dimensioning ISO, ANSI Std. dimensioning, tolerancing*	*Constructive Solid Geometry, Boolean operations, Creating combination of solids*	*Design new components as a team*	*Creation of parametric parts for assembly*
	SLO-2	*Spirals*		*isometric, perspective, shaded, wire-frame*	*Design new components as a team*	*non- parametric parts for assembly*
S-6	**SLO-1**	*Introduction to perspective projection with terminologies and concepts*	*Projection of solid prisms and cylinders inclined to both the planes*	*Section of right regular solid with axis perpendicular to one principal planes and*	*3D Part to 2D Drawingsgeometric dimensioning and tolerancing annotations*	*Simple assembly of parts,*
	SLO-2	*Orthographic multiview and isometric projection*	*change of position method, reference line method / auxiliary projections,*	*cutting plane perpendicular to any one principle plane true shape of the section*	*generating 2D from 3D models, printing drawings, generating sectional views*	*associated part and assembly*
S-7	**SLO-1**	*Perspective projection of a point, line*	*Projection of solid prisms and cylinders inclined to both the planes*	*Section of right regular solid with axis perpendicular to one principal planes and*	*Geometric dimensioning and tolerancing annotations*	*Simple assembly of parts,*
	SLO-2	*Perspective projection of a planes, solids*	*Change of position method*	*cutting plane perpendicular to any one principle plane true shape of the section*	*Geometric dimensioning and tolerancing annotations*	*associated part and assembly*
S-8	**SLO-1**	*Orthographic multiview of point, line*	*Projection of solid prisms and cylinders inclined to both the planes*	*Section of right regular solid with axis perpendicular to one principal planes and*	*Generating 2D drawings from 3D models*	*Simple assembly of parts,*

	SLO-2	*Orthographic multiview of planes, solids*	*Reference line method*	*cutting plane perpendicular to any one principle plane true shape of the section*	*Generating 2D drawings from 3D models*	*associated part and assembly*
S-9	**SLO-1**	*Isometric projection of a point, line*	*Auxiliary projections*	*Section of solids with axis inclined to both the planes and cutting plane perpendicular to any one principal plane only.*	*Generating sectional views*	*Simple assembly of parts,*
	SLO-2	*Isometric projection of planes, solids*	*Auxiliary projections*		*Generating sectional views*	*associated part and assembly*
S-10	SLO-1	*Isometric to orthographic multiview sketching*	*Viewing isometric and perspective views, shaded, wire-frame models*	*Sectional plan elevation, and sectional side-view of Building/ dwelling, include windows, doors, fixtures, etc.*	*Printing drawings to printer or as .pdf*	*Simple assembly of parts,*
	SLO-2	*Orthographic multiview to isometric sketch*	*Oblique prismatic solids and its projections*		*Printing drawings to printer or as .pdf*	*associated part and assembly*
S-11	SLO-1	*Orthographic multiview projection of lines inclined to both planes*	*Projection of solid pyramids and cones inclined to both the planes*	*Building/ Dwelling drawing, Terminology, conventions, sectional plan and side-view of Building/ dwelling, include windows, doors, fixtures,*	*Development of surfaces: un-cut, & cut right/ oblique regular solids*	*Assembly Drawings: exploded view with assembly annotations part details*
	SLO-2	*Orthographic multiview projection of planes inclined to planes, auxiliary projection*	*change of position method and reference line method/ auxiliary projections,*		*Simple position with cutting planes perpendicular to any one principal plane*	*Printing assembly drawings to printer and as pdf*
S-12	SLO-1	*Projection of lines inclined to both the planes*	*Projection of solid pyramids and cones inclined to both the planes*	*Sectional plan elevation, and sectional side-view of Building/ dwelling, include windows, doors, fixtures, etc.*	*Development of surfaces: un-cut, & cut right/ oblique regular solids*	*Exploded view with assembly annotations*
	SLO-2	*true length, true inclinations, traces of lines*	*Change of position method*		*Simple position with cutting planes perpendicular to any one principal plane*	*part details*
S-13	SLO-1	*Projection of lines inclined to both the planes*	*Projection of solid pyramids and cones inclined to both the planes*	*Sectional plan elevation, and sectional side-view of Building/ dwelling, include windows, doors, fixtures, etc.*	*Development of surfaces: un-cut, & cut right/ oblique regular solids*	*Exploded view with assembly annotations*
	SLO-2	*true length, true inclinations, traces of lines*	*Change of reference line method*		*Simple position with cutting planes perpendicular to any one principal plane*	*part details*
S-14	SLO-1	*Finding shortest distance between a point and a plane*	*Auxiliary projections*	*Sectional plan elevation, and sectional side-view of Building/ dwelling, include windows, doors, fixtures, etc.*	*Design of real time surface-development*	*Exploded view with assembly annotations*
	SLO-2	*Shortest distance between two lines*	*Auxiliary projections*		*Design of real time surface-development*	*part details*
S-15	SLO-1	*shortest distance between point and plane*	*Viewing isometric and perspective views, shaded, wire-frame models*	*Sectional plan elevation, and sectional side-view of Building/ dwelling, include windows, doors, fixtures, etc.*	*Design of real time surface-development*	*Printing assembly drawings*
	SLO-2	*shortest distance between point and plane*	*Oblique pyramidal solids and projections*		*Design of real time surface-development*	*Printing assembly drawings*

Learning Resources

1. *Bhatt, N.D., Engineering Drawing (First Angle Projection),53rd ed., Charotar Publishing House, 2017*
2. *Bethunc, J., Engineering Graphics with AutoCAD 2017, Pearson Education, 2016*
3. *Khristofor Artemyevich Arustamov, Problems in projective geometry, MIR Publishers, Moscow, 1972*
4. *Natarajan, K.V., A Text Book of Engineering Graphics, 21st Edition, Dhanalakshmi Pub., 2012*
5. *Shah. M. B.,Rana, B. C, Engineering Drawing, Pearson Education, Pvt. Ltd., 2005*
6. *Jeyapoovan. T., Engineering Drawing and Graphics using AutoCAD, Vikas Pub. House, 2015*
7. *Narayanan, K. L.,Kannaiah, V., Engineering Graphics, Scitech Publications,2010*
8. *Luzzader, Warren J., Duff John M., Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Prentice Hall of India Pvt. Ltd,, 2005.*
9. *Mohammad Dastbaz, Chris Gorse, Alice Moncaster (eds.), Building Information Modelling, Building Performance, Design and Smart Construction, Springer 2017*
10. *User Manual of Respective CAD Softwares*

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
1.Dr. R. Kalimuthu, ISRO,	*1.Dr. Ramkumar P, IIT Madras, ramkumar@iitm.ac.in*	*1. Mr. D. Kumaran, SRMIST*
2.Dr. A. Velayutham, DRDO,	*2. Dr. Sourav Rakshit, IIT Madras, srakshit@iitm.ac.in*	*2. Mr. S. Balamurugan, SRMIST*

Note: *For all B.Tech Programmes other than Civil, Mechanical, Automobile, Aerospace and Mechatronics, the entire course would be conducted using CAD Software only.*

Course Code	18EES101J	Course Name	BASIC ELECTRICAL & ELECTRONICS ENGINEERING	Course Category	S	*Engineering Sciences*	L	T	P	C
							3	1	2	5

Pre-requisite Courses	*Nil*	Co-requisite Courses	*Nil*	Progressive Courses	*Nil*
Course Offering Department	*Electrical & Electronics 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 :	*Analyze given electric circuits consisting of active and passive components*			
CLR-2 :	*Identify the parts, functions and working of motors, generators and transformers that function in AC and DC*			
CLR-3 :	*Utilize the basic electronic devices and circuits*			
CLR-4 :	*Utilize transducers for measuring displacement, pressure, flow, sound, light, temperature, chemical changes etc.,*			
CLR-5 :	*Build simple logical circuits using Boolean expressions. Identify elements in a communication system*			
CLR-6 :	*Utilize the basic electrical circuits, machines, electronic devices, transducers and digital system principles and operations*			

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 basic theory utilized in electrical circuits and its circuits*	*3*	*75*	*70*	*H*	*M*	*L*	*L*	*M*	*-*	*M*	*M*	*M*	*M*	*-*	*M*	*-*	*-*	*-*
CLO-2 :	*Identify working principle of direct current and alternative current machines such as transformers, motors and generators*	*2*	*75*	*70*	*H*	*M*	*L*	*L*	*M*	*-*	*M*	*M*	*M*	*M*	*-*	*M*	*-*	*-*	*-*
CLO-3 :	*Operate the basic electronic devices. Identify their uses and construction features*	*3*	*75*	*70*	*H*	*-*	*L*	*L*	*M*	*-*	*M*	*M*	*M*	*M*	*-*	*M*	*-*	*-*	*-*
CLO-4 :	*Identify the different types of transducers used in measurement of various physical parameters*	*3*	*75*	*70*	*H*	*-*	*L*	*M*	*M*	*-*	*M*	*M*	*M*	*M*	*-*	*M*	*-*	*-*	*-*
CLO-5 :	*Apply binary logic and Boolean expressions for digital circuit design, Identify elements in a communication Systems*	*3*	*75*	*70*	*H*	*M*	*M*	*M*	*M*	*-*	*M*	*M*	*M*	*M*	*-*	*M*	*-*	*-*	*-*
CLO-6 :	*Identify the basic electrical circuits, machines, electronic devices, transducers and digital system principles and operations*	*3*	*75*	*70*	*-*	*-*	*L*	*M*	*M*	*-*	*M*	*M*	*M*	*M*	*-*	*M*	*-*	*-*	*-*

		Electrical Circuits	*D.C Machines& A.C Machines*	*Electronic Devices*	*Transducers*	*Digital Systems*
Duration (hour)		**18**	**18**	**18**	**18**	**18**
S-1	**SLO-1**	*Introduction to DC and AC circuits*	*Sinusoids, Generation of AC, Average, RMS values, Form and peak factors*	*Safety measures in electrical systems*	*Transducer function and requirements*	*Number systems, binary codes*
	SLO-2	*Active andPassive two terminal elements*	*Analysis of single phase AC circuit, Real, Reactive, Apparent power, Power factor*	*Types of wiring, wiring accessories*	*Classification: Active and Passive*	*Binary arithmetic*
S-2	**SLO-1**	*Ohms law,Voltage-Current relation, Power, Energy*	*Magnetic materials, B-H Characteristics Simple magnetic circuits*	*House wiring for staircase, fluorescent lamp, LED lamp & corridor wiring*	*Displacement: Capacitive, Inductive, Variable Inductance*	*Boolean algebra, laws and theorems*
	SLO-2	*R,L,C Circuits, Voltage and Current Sources*	*Faraday's laws, induced emfs and inductances.*	*Basic principles of earthing, Types of earthing. Grounding in DC circuits*	*Linear Variable Differential Transformer*	*Simplification of Boolean expression*
S-3	**SLO-1**	*Kirchoff's current law*	*1 - phase transformers: Construction, types, ideal, practical transformer*	*Basic principles and classification of instruments*	*Electromechanical: Pressure, Flow, Accelerometer, Potentiometer etc.*	*Logic Gates and Operations*
	SLO-2	*Kirchoff's voltage law*	*EMF equation, Regulation, Efficiency*	*Moving coil and moving iron instruments*	*Strain Gauge*	*Simplification of Boolean expression*
S-4	**SLO-1**	*Problem Solving Session*	*Problem Solving Session*	*Problem Solving Session*	*Problem Solving Session*	*Problem Solving Session*
	SLO-2					
S 5-6	**SLO-1**	*Lab 1: Verification of Kirchoff's Law*	*Lab 4: Transformer Operation, Efficiency*	*Lab 7:**Types of wiring (fluorescent lamp wiring, staircase wiring, godown wiring)***	*Lab 10: Measurement using LVDT and Strain Gauge*	*Lab 13: Verification of Boolean expression using logic gates*
	SLO-2					
S-7	**SLO-1**	*Mesh Current Analysis*	*Construction, working of DC Generators*	*Overview of Semiconductors*	*Chemical: pH probes, Electro galvanic Sensor etc.,*	*SOP and POS Expressions*
	SLO-2	*Nodal Voltage Analysis*	*Types of DC generators*	*PN junction diode*	*Electroacoustic: Mic, Speaker, Piezoelectric, Sonar, Ultrasonic*	*Standard forms of Boolean expression*
S-8	**SLO-1**	*Thevenin's Theorem*	*Characteristics of Generators*	*Zener diode*	*Tactile, Geophones, Hydrophone*	*Simplify using Boolean Expressions*
	SLO-2	*Norton's Theorem*	*Armature reaction, Losses*	*Diode circuits: rectifiers, half and full wave*	*Electrooptical: LED, Laser, Photodiode, Photoresistor, Phototransistor*	*Minterm and Maxterm*
S-9	SLO-1	*Maximum Power Transfer Theorem*	*Power stages of DC generators*	*Bridge type rectifier, filter circuit*	*Photoconductive cell, photovoltaic cell, solar cell*	*K-Map Simple ReductionTechnique*
	SLO-2	*Star- Delta Transformation*	*Working and types of DC motors, Characteristics, Starters*	*Clippers and clampers*	*LED, infrared emitters, LCD, optocouplers*	*Two, Three and Four Variable K-Map*
S-10	**SLO-1**	*Problem Solving Session*	*Problem Solving Session*	*Problem Solving Session*	*Problem Solving Session*	*Problem Solving Session*

	SLO-2					
S 11-12	**SLO-1**	*Lab 2: Verification of all Theorems*	*Lab 5: Demo of DC Machine & Parts*	*Lab 8: Characteristics of semiconductor devices*	*Lab 11: Measurement using Electro acoustic and Electrooptical transducers*	*Lab 14: Reduction using Digital Logic Gates*
	SLO-2					
S-13	SLO-1	*Resistive Circuit Analysis*	*Construction, working of AC Generators*	*BJT construction, operation*	*Thermoelectric: Resistance Temperature Detectors*	*Principles of Communication*
	SLO-2	*Superposition, Convolution*	*Types of AC generators*	*BJT characteristics (CB, CE and CC configurations) and uses*	*Thermocouple*	*Block diagram of a Communication System*
S-14	SLO-1	*RL Circuit Transient Analysis*	*Characteristics of AC Generators, Losses*	*JFET construction, operation*	*Thermister*	*Amplitude Modulation*
	SLO-2	*RC & RLC Transient Analysis*	*Single Phase and Three Phase Machines*	*JFET characteristics (CS configuration) and uses.*	*Electrostatic: Electrometer*	*Frequency Modulation*
S-15	SLO-1	*Three Phase Systems, Connections*	*Working and types of AC motors*	*MOSFET construction, operation*	*Electromagnetic: Antenna, Hall effect, Magnetic Cartridge etc.,*	*Phase Modulation*
	SLO-2	*Relation between Line and Phase*	*Induction, Squirrel Cage, Synchronous*	*MOSFET characteristics (CS configuration) and uses*	*Radioacoustic: Geiger Muller Tubes, Radio receiver, Radio transmitter*	*Demodulation*
S-16	**SLO-1**	*Problem Solving Session*	*Problem Solving Session*	*Problem Solving Session*	*Problem Solving Session*	*Problem Solving Session*
	SLO-2					
S 17-18	**SLO-1**	*Lab 3: Time Domain Analysis (RL, RC)*	*Lab 6: Demo of AC Machine & Parts*	*Lab 9: Wave shaping circuits*	*Lab 12: Measurement using Thermoelectric and Electromagnetic*	*Lab 15: Demo of Transmission and Reception using MODEM*
	SLO-2					

Learning Resources	*1. Dash.S.S, Subramani.C, Vijayakumar.K, Basic Electrical Engineering, 1st ed.,Vijay Nicole, 2013* *2. Jegatheesan.R,AnalysisofElectricCircuits, Tata McGraw-Hill, 2014* *3. P. S.Bimbhra,ElectricalMachinery,7th ed,. Khanna Publishers, 2011*	*4. R. Muthusubramanian, S. Salivahanan,"Basic Electrical and Electronics Engineering, Tata McGraw-Hill, 2012* *5. Moris M. Mano, Digital Design, 3rd ed.,Pearson, 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	*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
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Course Code	18MES103L	Course Name	CIVIL AND MECHANICAL ENGINEERING WORKSHOP	Course Category	S	Engineering Sciences	L	T	P	C
							1	0	4	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Civil Engineering &Mechanical 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 :	Practice machining and glass cutting shop floor trade			
CLR-2 :	Practice arc & gas welding, and fitting and make new assemblies according to various dimensions and tolerances			
CLR-3 :	Practice basic carpentry joints and sheet metal shop floor practices.			
CLR-4 :	Practice casting, moulding, & smithy trades			
CLR-5 :	Practice and make G.I & P.V.C. plumbing trade			
CLR-6 :	Practice machining, glass cutting, welding, fitting, carpentry, sheet metal, casting, moulding, smithy and plumbing			

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 :	Machine in a lathe. Drill using drilling machines. Cut glass. Create new components according to specifications	1	90	85	H	L	H	L	M	H	H	L	M	L	L	H	L	L	L
CLO-2 :	Weld joints using arc & gas welding. Fit pipes and fixtures. Make new assembly for given dimensions, and tolerances	1	90	85	H	L	H	L	H	H	H	L	H	L	L	H	M	M	M
CLO-3 :	Practice basic carpentry joints used in house hold furniture items, and sheet metal items used shop floor practices	1	90	85	H	L	H	L	M	M	H	L	M	L	L	M	L	L	L
CLO-4 :	Practice casting, moulding, & smithy trades	2	90	85	H	L	M	L	M	H	H	L	L	L	L	M	L	L	L
CLO-5 :	Make G.I & P.V.C. pipe line connections used in the plumbing trade	2	90	85	H	L	H	L	M	H	M	L	L	L	L	M	L	L	L
CLO-6 :	Practice basic skills of machining, glass cutting, welding, fitting, carpentry, sheet metal, casting, mouldings, smithy and plumbing	2	90	85	H	L	H	L	M	H	H	L	M	L	L	M	L	L	L

		Machining, Drilling, Tapping, Glass cutting	Welding (Arc and Gas) and fitting	Carpentry and Sheet metal	Casting, moulding and smithy	Plumbing (G.I and P.V.C)
Duration (hour)		15	15	15	15	15
S-1	SLO-1	Machining: Basics of Machining Processes Equipment's	Basics of Metal Arc welding operations, Equipment's	Basics of Carpentry operations, Equipment's	Basics of Casting, processes, Equipment's	Basics of Plumbing practices for G.I and P.V.C.
	SLO-2	Tools and demonstration of machining to produce models	Tools and demonstration of producing models	Tools and demonstration of producing models	Tools and demonstration of producing models	Tools and demonstration of producing models
S 2-5	SLO-1	Simple turning of cylindrical surface on MS rod using lathe machine tool	Butt joint of two metal plates using arc welding process	Cross halving joint of two wooden pieces at perpendicular direction	To make the mould using stepped flange	Plumbing of bathroom/ kitchen fittings using G.I. fittings
	SLO-2	Simple turning of cylindrical surface on MS rod using lathe machine tool	Lap joint of two metal plates overlapping on one another using arc welding process.	To make duster from wooden piece using carpentry tools.	To make the mould using stepped flange	Plumbing of bathroom/ kitchen fittings using G.I. fittings
S-6	SLO-1	Basics of drilling and tappingprocesses, Equipment's, tools	Basics of gas welding operations, Equipment's,	Basics of Sheet metal operations, Equipment's	Basics of injection moulding and processes, Equipment's,	PVC Plumbing of bathroom/ kitchen fittings using P.V.C. fittings
	SLO-2	Demonstration of drilling and tapping to produce models.	Tools and demonstration of producing models	Tools and demonstration of producing sheet metal models	Tools and demonstration of producing models	Tools and demonstration of producing models
S 7-10	SLO-1	Generate hole on a metal piece	MIG welding of metal plates	To make Rectangular shaped tray using GI sheet	To make plastic models using injection moulding of simple part	Plumbing of bathroom/ kitchen fittings using P.V.C. fittings
	SLO-2	Generate internal thread on a metal piece	TIG welding of metal plates	To make bigger size scoop using GI sheet.	To make plastic models using injection moulding of simple part	Plumbing of bathroom/ kitchen fittings using P.V.C. fittings
S-11	SLO-1	Basics of Glass cutting processes, Equipment's.	Basics of fitting practice, tools and method of producing models	Basics of different geometrical shapes in Sheet metal operations	Basics of Smithy processes, Equipment's,	Basics of Plumbing practices for G.I pipe lines and fittings for pumps and machines
	SLO-2	Tools and demonstration of producing models	Tools and demonstration of producing models	Equipment's, tools and demonstration of producing models	Tools and demonstration of producing models	Equipment's, tools and demonstration of producing models.
S 12-15	SLO-1	Make glass panels for boxes	Step fitting of two metal plates using fitting tools	To make geometrical shape like frustum, Cone and Prismusing G.I sheet	To forge chisel from MS rod using black smithy	Plumbing of pipe lines and fitting for Pumps using G.I fittings
	SLO-2					

Learning Resources

1. Jeyachandran K., Natarajan S. &Balasubramanian S., A Primer on Engineering Practices Laboratory, Anuradha Publications, 2007
2. Jeyapoovan T., Saravanapandian M. & Pranitha S., Engineering Practices Lab Manual,Vikas Publishing House Pvt.Ltd, 2006.
5. Kannaiah P. & Narayana K.L., Manual on Workshop Practice, Scitech Publications, 1999.
6. Hajra Choudhury S.K., Hajra Choudhury A.K., Nirjhar Roy S.K., Elements of Workshop Technology, Vol.I & Vol.II 2010, Media promoters andpublishers private limited, Mumbai.
7. Rao P.N., Manufacturing Technology, Vol. I & Vol. II, Tata McGrawHill,2017.

	3. Bawa H.S., Workshop Practice, Tata McGraw, 2007. *4. Rajendra Prasad A. & Sarma P.M.M.S., Workshop Practice, Sree Sai Publication, 2002.*	*8. Gopal T.V, Kumar. T, Murali. G, A first course on workshop practice – Theory, Practice and Work Book, Suma Publications, Chennai, 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%*	-	*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
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2.Dr. A. Velayutham, DRDO,	*2. Dr. Sourav Rakshit, IIT Madras, srakshit@iitm.ac.in*	*2. Dr. S. Prabhu, SRMIST*

Course Code	18CSS101J	Course Name	PROGRAMMING FOR PROBLEM SOLVING	Course Category	S	Engineering Sciences	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:*

		Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
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 logical operators and expressions to solve problems in engineering and real-time			
CLR-3 :	Store and retrieve data in a single and multidimensional array			
CLR-4 :	Utilize custom designed functions that can be used to perform tasks and can be repeatedly used in any application			
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			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 methods to solve a problem through computer programming. List the basic data types and variables in C	2	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-2 :	Apply the logic operators and expressions. Use loop constructs and recursion. Use array to store and retrieve data	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-3 :	Analyze programs that need storage and form single and multi-dimensional arrays. Use preprocessor constructs in C	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-4 :	Create user defined functions for mathematical and other logical operations. Use pointer to address memory and data	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-5 :	Create structures and unions to represent data constructs. Use files to store and retrieve data	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-6 :	Apply programming concepts to solve problems. Learn about how C programming can be effectively used for solutions	3	85	80	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-

Duration (hour)		21	21	21	21	21
S-1	SLO-1	Evolution of Programming& Languages	Relational and logical Operators	Initializing and Accessing 2D Array	Passing Array Element to Function	Initializing Structure, Declaring structure variable
	SLO-2	Problem solving through programming	Condition Operators, Operator Precedence	Initializing Multidimensional Array	Formal and Actual Parameters	Structure using typedef, Accessing members
S-2	SLO-1	Creating algorithms	Expressions with pre / post increment operator	Array Programs – 2D	Advantages of using Functions	Nested structure Accessing elements in a structure array
	SLO-2	Drawing flowcharts	Expression with conditional and assignment operators	Array Contiguous Memory	Processor Directives and #define Directives	Array of structure Accessing elements in a structure array
S-3	SLO-1	Writing pseudocode	If statement in expression	Array Advantages and Limitations	Nested Preprocessor Macro	Passing Array of structure to function
	SLO-2	Evolution of C language, its usage history	L value and R value in expression	Array construction for real-time application Common Programming errors	Advantages of using Functions	Array of pointers to structures
S 4-7	SLO-1	Lab 1: Algorithm, Flow Chart, Pseudocode	Lab 4: Operators and Expressions	Lab 7: Arrays - Multidimensional	Lab 10: Functions	Lab 13: Structures & Unions
	SLO-2					
S-8	SLO-1	Input and output functions: Printf and scanf	Control Statements – if and else	String Basics	Pointers and address operator	Bit Manipulation to structure and Pointer to structure
	SLO-2	Variables and identifiers	else if and nested if, switch case	String Declaration and Initialization	Size of Pointer Variable and Pointer Operator	Union Basic and declaration
S-9	SLO-1	Expressions	Iterations, Conditional and Unconditional branching	String Functions: gets(), puts(), getchar(), putchar(), printf()	Pointer Declaration and dereferencing pointers	Accessing Union Members Pointers to Union
	SLO-2	Single line and multiline comments	For loop	String Functions: atoi, strlen, strcat, strcmp	Void Pointers and size of Void Pointers	Dynamic memory allocation, mallaoc, realloc, free
S-10	SLO-1	Constants, Keywords	While loop	String Functions: sprint, sscanf, strrev, strcpy, strstr, strtok	Arithmetic Operations	Allocating Dynamic Array
	SLO-2	Values, Names, Scope, Binding, Storage Classes	do while, goto, break, continue	Arithmetic Characters on Strings	Incrementing Pointers	Multidimensional array using dynamic memory allocation.
S 11-14	SLO-1	Lab 2: Input and Output Statements	Lab 5: Control Statements	Lab 8: Strings	Lab 11: Pointers	Lab 14: Structures & Unions
	SLO-2					

S-15	**SLO-1**	*Numeric Data types: integer*	*Array Basic and Types*	*Functions declaration and definition*	*Constant Pointers*	*file: opening, defining, closing, File Modes, File Types*
	SLO-2	*Numeric Data types: floating point*	*Array Initialization and Declaration*	*Types: Call by Value, Call by Reference*	*Pointers to array elements and strings*	*Writing contents into a file*
S-16	**SLO-1**	*Non-Numeric Data types: char and string*	*Initialization: one Dimensional Array*	*Function with and without Arguments and no Return Values*	*Function Pointers*	*Reading file contents*
	SLO-2	*Increment and decrement operator*	*Accessing, Indexing one Dimensional Array Operations*	*Function with and without Arguments and Return Values*	*Array of Function Pointers*	*Appending an existing file*
S-17	**SLO-1**	*Comma, Arrow and Assignment operator*	*One Dimensional Array operations*	*Passing Array to Functions with return type*	*Accessing Array of Function Pointers*	*File permissions and rights*
	SLO-2	*Bitwise and Sizeof operator*	*Array Programs – 1D*	*Recursion Functions*	*Null Pointers*	*Changing permissions and rights*
S 18-21	**SLO-1**	*Lab 3: Data Types*	*Lab 6: Arrays – One Dimensional*	*Lab 9: Functions*	*Lab 12: Pointers*	*Lab 15: File Handling*
	SLO-2					

Learning Resources	*1. Zed A Shaw, Learn C the Hard Way: Practical Exercises on the Computational Subjects You Keep Avoiding (Like C), Addison Wesley, 2015* *2. W. Kernighan, Dennis M. Ritchie, The C Programming Language, 2nd ed. Prentice Hall, 1996*	*3. Bharat Kinariwala, Tep Dobry, Programming in C, eBook* *4. http://www.c4learn.com/learn-c-programming-language/*

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
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2. Dr. Sricharan Srinivasan, Wipro Technologies, sricharanms@gmail.com	*2. Dr. Rajeev Sukumaran, IIT Madras, rajeev@wmail.iitm.ac.in*	*2. Dr. B. Amutha, SRMIST*

Course Code	18CSS201J	Course Name	ANALOG AND DIGITAL ELECTRONICS	Course Category	S	Engineering Sciences	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 :	Identify the applications of analog electronics
CLR-2 :	Identify the applications of digital logic families
CLR-3 :	Design the combinational and sequential logic circuits
CLR-4 :	Implement the combinational and sequential logic circuits
CLR-5 :	Analyze the design of counters and registers
CLR-6 :	Utilize the concepts in real time scenarios

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 :	Identify the analog and digital components in circuit design	1	80	70
CLO-2 :	Analyze the combinational and sequential logic circuits	2	85	75
CLO-3 :	Apply gates and flip-flops in circuit design	2	75	70
CLO-4 :	Use simulation package and realize	2	85	80
CLO-5 :	Apply HDL code and synthesize	2	85	75
CLO-6 :	Build the circuits in bread board and demonstrate and FGPA	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	H	H	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-2	H	H	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-3	H	-	H	H	-	-	-	-	-	-	-	-	-	-	-
CLO-4	H	H	H	H	H	-	-	-	-	-	-	H	-	-	-
CLO-5	H	-	H	H	H	-	-	-	-	-	-	-	-	-	-
CLO-6	-	-	H	H	-	H	-	-	H	-	H	-	-	-	-

		Introduction to Analog electronics	Logic Families	Combinational Logic Circuits	Sequential Logic circuits	Registers & Counters
Duration (hour)		15	15	15	15	15
S-1	SLO-1	Characteristics of BJT (CB, CE and CC configurations) and DC biasing	Transistor as a Switch	Quine-McCluskey minimization technique	Sequential circuits, Latch and Flip-Flops	Registers and Types of Registers- Serial In - Serial Out, Serial In - Parallel out
	SLO-2	**BJT Uses**	Characteristics of Digital ICs	Combinational Circuits	RS Flip-Flops,	Parallel In - Serial Out, Parallel In - Parallel Out
S-2	SLO-1	Characteristics and uses of JFET (CS, Common Drain and Common Gate)	**DL, RTL**	Multiplexer	Gated Flip-Flops	Universal Shift Register
	SLO-2	Differences between BJT and JFET	DTL,TTL	Demultiplexer	Edge-triggered RS FLIP-FLOP	Applications of Shift Registers
S-3	SLO-1	Transistor Amplifier: CE amplifier	ECL	**Decoder**	Edge-triggered D FLIP-FLOPs	Synchronous Counters
	SLO-2	Transistor Amplifier: CC ,CB amplifier	IIL	**Encoder**	Edge-triggered T FLIP-FLOPs	Asynchronous Counters
S 4-5	SLO-1	Lab 1:Design and Implement Half and Full Wave Rectifiers using simulation	**Lab 4: Design and implement transistor as a switch**	Lab 7:Design and implement code converters using logic gates simulation	**Lab 10:HDL implementation of Flip-Flop**	Lab 13: Implement SISO, SIPO, PISO and PIPO shift registers using Flip- flops
	SLO-2					
S-6	SLO-1	Power Amplifiers: Different classes of Amplifiers and its operation-Class A	Characteristics and uses of MOSFET (CS, Common drain and Common gate)	Binary adder	Edge-triggered JK FLIPFLOPs	Changing the Counter Modulus
	SLO-2	Class B, AB and C	MOSFET Logic	**Binary adder as subtractor**	JK Master-slave FLIP-FLOP	Decade Counters
S-7	SLO-1	Operational Amplifiers: Ideal v/s practical Op-amp	PMOS,NMOS	**Carry look ahead adder**	Analysis of SynchronousSequential Circuit, **State Equation, State table**	Presettable counters
	SLO-2	Performance Parameters	**CMOS Logic**	Decimal adder	**State Diagram**	Counter Design as a Synthesis problem
S-8	SLO-1	Applications: Peak detector, Comparator, Inverting, Non-Inverting Amplifiers	Propagation delay	Magnitude Comparator	Synthesis of sequential circuit using Flip-Flops	Seven segment Display and A Digital Clock.
	SLO-2	Problem solving session	Problem solving session	Problem solving session	Problem solving session	Problem solving session
S 9-10	SLO-1	Lab 2: Design and implement Schmitt trigger using Op-Amp (simulation)	Lab 5: Design CMOS Inverter, measure propagation delay for rising & falling edge	Lab 8: Design and implement using simulation the combinational circuits	Lab 11: Design and implement using simulation; Synchronous sequential circuits	Lab 14:HDL for Registers and Counters
	SLO-2					

S-11	SLO-1	*Effect of positive and Negative Feedback Amplifiers,*	*Tristate Logic*	*Read Only Memory*	*Asynchronous sequential circuit*	*D/A Conversion*
	SLO-2	*Analysis of Practical Feedback Amplifiers*	*Tristate Logic Applications*	*Arithmetic Logic Unit*	*Transition Table*	*Types of D/A Converters*
S-12	SLO-1	*Oscillator Operation*	*FPGA Basics*	*Programmable Logic Arrays*	*State table*	*Problem*
	SLO-2	*Crystal Oscillator*	*Introduction to HDL and logic simulation*	*HDL Gate and Data Flow modeling*	*Flow table*	*A/D Conversion*
S-13	SLO-1	*Overview of UJT, Relaxation Oscillator,555 Timer*	*HDL System primitives, user defined primitives, Stimulus to the design*	*HDL Behavioral modeling*	*Analysis of asynchronous sequential circuits*	*Types of A/D conversion*
	SLO-2	*Problem solving session*	*Problem solving session*	*Problem solving session*	*Problem solving session*	*Problem solving session*
S 14-15	**SLO-1** **SLO-2**	*Lab 3:Design and implement using simulator a rectangular waveform generator (Op-Amp relaxation oscillator)*	*Lab 6: HDLProgram to realize delay and stimulus in simple circuit*	*Lab 9: HDL program for combinational circuits*	*Lab 12: HDL program for Sequential circuits*	*Lab 15: Design and Implement an A/D Converter.*

Learning Resources	*1. Robert L. Boylestad& Louis Nashelsky, Electronic Devices & Circuit Theory, 11th ed., Pearson, 2013* *2. Anil K Maini, Varsha Agarwal: Electronic Devices and Circuits, Wiley, 2012* ***3.** Paul Tuinenga, SPICE: A Guide to Circuit Simulation and Analysis Using PSpice, 3rd ed., Prentice-Hall, 1995,*	*4. Douglas A, G.K. Kharate, Digital Electronics, Oxford university Press,2012* *5. M. Morris R. Mano, Michael D. Ciletti, Digital Design: With an Introduction to the Verilog HDL, VHDL, and SystemVerilog, 6th ed., Pearson, 2018* *6. A.P. Malvino, Electronic Principles,7th Edition, Tata Mcgraw Hill Publications, 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.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
*1. **Dr.**Devi Jayaraman , Virtusa, devij@virtusa.com*	*1.Dr. J. Dhalia Sweetlin, Anna University,jdsweetlin@mitindia.edu*	*1. Dr. Annapurani Panaiyappan.K, SRMIST*
2. Dr. Viswanadhan, Teken BIM Technologies, viswanathan_alladi@yahoo.com	2. Dr. B. Latha, Sairam Engineering College, hod.cse@sairam. edu.in	*2. Dr. D. Anitha, SRMIST* *3. Ms. Kayalvizhi J, SRMIST*

Course Code	18CSS202J	Course Name	COMPUTER COMMUNICATIONS	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:*	**Learning**		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	*Understand the basic services and concepts related to Internetwork*			
CLR-2 :	*Understand the layered network architecture*			
CLR-3 :	*Acquire knowledge in IP addressing*			
CLR-4 :	*Exploring the services and techniques in physical layer*			
CLR-5 :	*Understand the functions of Data Link layer*			
CLR-6 :	*Implement and analyze the different Routing Protocols*			

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 :	*Apply the knowledge of communication*	*2*	*80*	*70*
CLO-2 :	*Identify and design the network topologies*	*3*	*85*	*75*
CLO-3 :	*Design the network using addressing schemes*	*3*	*75*	*70*
CLO-4 :	*Identify and correct the errors in transmission*	*1*	*85*	*80*
CLO-5 :	*Identify the guided and unguided transmission media*	*1*	*85*	*75*
CLO-6 :	*Design and implement the various Routing 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
CLO-1 :	*H*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-2 :	*H*	-	*H*	-	-	-	-	-	-	-	-	-	*M*	-	-
CLO-3 :	*H*	*H*	-	-	-	-	-	-	-	-	-	-	*M*	-	*M*
CLO-4 :	*H*	*H*	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-5 :	*H*	-	-	*H*	-	-	-	-	-	-	-	-	-	-	-
CLO-6 :	*H*	*H*	*H*	*H*	*H*	-	-	-	-	-	-	-	*M*	-	*M*

Duration (hour)		**12**	**12**	**12**	**12**	**12**
S-1	SLO-1	*Evolution of Computer Networks, Network categories*	*IPv4 Addressing, Address space*	*Line coding: Unipolar scheme*	*Framing, Flow Control Mechanisms*	*Forward Techniques, Forwarding Process*
	SLO-2	*Data Transmission Modes, Network topologies*	*Dotted Decimal Notation. Classful Addressing*	*Polar schemes, Bipolar schemes*	*Sender side Stop and Wait Protocol, Receiver side Stop and Wait Protocol*	*Routing Table*
S-2	SLO-1	*Circuit Switching and Packet Switching*	*Subnet Mask*	*Amplitude shift keying, Frequency shift keying*	*Goback N ARQ, Selective Reject ARQ*	*Intradomain Routing and Interdomain Routing*
	SLO-2	*Protocols and standards*	*Subnetting*	*Phase shift keying, Pulse code Modulation, Delta Modulation*	*CRC, Checksum*	*Static Routing and Dynamic Routing*
S 3-4	SLO-1 SLO-2	*Lab 1:* ***IP Addressing***	*Lab 4:* ***Router Configuration (Creating Passwords, Configuring Interfaces)***	*Lab 7: RIP v1*	*Lab 10:* ***EIGRP Authentication and Timers***	*Lab 13:* ***Examining Network Address Translation (NAT)***
S-5	SLO-1	*Layers in the OSI model, Functions of Physical layer, data link layer*	*Special Addresses*	*Multiplexing: FDM*	*Types of Errors*	*Distance Vector Routing, Problem Solving*
	SLO-2	*Functions of Network layer, Transport layer*	*Special Addresses*	*Multiplexing: FDM*	*Types of Errors*	*Link state Routing*
S-6	SLO-1	*Functions of Session, Presentation layer and Application layer*	*Classless Addressing*	*TDM*	*Forward Error correction*	*Problem solving*
	SLO-2	*TCP/IP protocol suite ,Link layer protocols*	*Problem Solving*	*WDM*	*CSMA, CSMA/CD*	*Path vector Routing*
S 7-8	SLO-1 SLO-2	*Lab 2: Subnetting (VLSM)*	*Lab 5: Basic Switch Configuration: Vlan*	*Lab 8: RIP v2*	*Lab 11: Single-Area OSPF Link Costs and Interface*	*Lab 14: BGP Configuration*
S-9	SLO-1	*Network layer protocols*	*Private Address, NAT, Supernetting*	*Guided Media: Twisted Pair, Coaxial Cable Fiber optic cable*	*Hamming Distance*	*RIP v1,RIP v2*
	SLO-2	*Transport layer protocols*	*Hub, Repeaters, Switch*	*Unguided media: Radio waves*	*Correction Vs Detection*	*OSPF*
S-10	SLO-1	*Serial and Parallel Transmissions*	*Bridge*	*Microwaves*	*HDLC*	*EIGRP*
	SLO-2	*Addressing*	*Structure of Router*	*Infrared*	*PPP*	*BGP*
S 11-12	SLO-1 SLO-2	*Lab 3: LAN Configuration using straight through and cross over cables*	*Lab 6: Static and Default Routing*	*Lab 9: EIGRP Configuration, Bandwidth, and Adjacencies*	*Lab 12: Multi-Area OSPF with Stub Areas and Authentication*	*Lab 15: Configuring Static and Default Routes*

Learning Resources	1. *Behrouz A. Forouzan, "Data Communications and Networking" 5th ed., 2010* 2. *Bhushan Trivedi," Data Communication and Networks" 2016*	3. *William Stallings, Data and Computer Communications,9th ed., 2010* 4. *Todd Lammle, CCNA Study Guide, 7th ed. 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 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. Dr. Viswanadhan, Teken BIM Technologies, viswanathan_alladi@yahoo.com	*1.Dr. J. Dhalia Sweetlin, Anna University,jdsweetlin@mitindia.edu*	*1. Mrs. T. Manoranjtham , SRMIST*
2. Dr.Devi Jayaraman , Virtusa, devij@virtusa.com	2. Dr. B. Latha, Sairam Engineering College, hod.cse@sairam. edu.in	*2. Mr. J. Godwin Ponsam, SRMIST Dr. J.S. Femilda Josephin, SRMIST*

Course Code	18CSC201J	Course Name	DATA STRUCTURES AND ALGORITHMS	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:
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 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 :	Identify linear and non-linear data structures. Create algorithms for searching and sorting	3	80	70	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-
CLO-2 :	Create the different types of linked lists and evaluate its operations	3	85	75	M	H	L	M	L	-	-	-	M	L	-	H	-	-	-
CLO-3 :	Construct stack and queue data structures and evaluate its operations	3	75	70	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-4 :	Create tree data structures and evaluate its types and operations	3	85	80	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-5 :	Create graph data structure, evaluate its operations, implement algorithms to identify shortest path	3	85	75	H	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-6 :	Construct the different data structures and evaluate their types and operations	3	80	70	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-

Duration (hour)		15	15	15	15	15
S-1	SLO-1	Introduction-Basic Terminology	Array	Stack ADT	General Trees	Graph Terminology
	SLO-2	Data Structures	Operations on Arrays – Insertion and Deletion	Stack Array Implementation	Tree Terminologies	Graph Traversal
S-2	SLO-1	Data Structure Operations	Applications on Arrays	Stack Linked List Implementation	Tree Representation	Topological sorting
	SLO-2	ADT	Multidimensional Arrays- Sparse Matrix	Applications of Stack- Infix to Postfix Conversion	Tree Traversal	Minimum spanning tree – Prims Algorithm
S-3	SLO-1	Algorithms – Searching techniques	Linked List Implementation - Insertion	Applications of Stack- Postfix Evaluation	Binary Tree Representation	Minimum Spanning Tree - Kruskal's Algorithm
	SLO-2	Complexity – Time , Space Trade off	Linked List- Deletion and Search	Applications of Stack- Balancing symbols	Expression Trees	Network flow problem
S 4-5	SLO-1	Lab 1: Implementation of Searching - Linear and Binary Search Techniques	Lab 4 :Implementation of Array – Insertion, Deletion.	Lab 7 :Implementation of stack using array and Linked List	Lab 10: Implementation of Tree using array	Lab 13: Implementation of Graph using Array
	SLO-2					
S-6	SLO-1	Algorithms - Sorting	Applications of Linked List	Applications of Stack- Nested Function Calls	Binary Tree Traversal	Shortest Path Algorithm- Introduction
	SLO-2	Complexity – Time , Space Trade off	Polynomial Arithmetic	Recursion concept using stack	Threaded Binary Tree	Shortest Path Algorithm: Dijkstra's Algorithm
S-7	SLO-1	Mathematical notations	Cursor Based Implementation – Methodology	Applications of Recursion:Tower of Hanoi	Binary Search Tree :Construction, Searching	Hashing: Hash functions - Introduction
	SLO-2	Asymptotic notations-Big O, Omega	Cursor Based Implementation	Queue ADT	Binary Search Tree : Insertion and Deletion	Hashing: Hash functions
S-8	SLO-1	Asymptotic notations - Theta	Circular Linked List	Queue Implementation using array	AVLTrees: Rotations	Hashing : Collision avoidance
	SLO-2	Mathematical functions	Circular Linked List - Implementation	Queue Implementation using Linked List	AVL Tree: Insertions	Hashing : Separate chaining
S 9-10	SLO-1	Lab 2: Implementation of sorting Techniques – Insertion sort and Bubble Sort Techniques	Lab 5: Implementation of Linked List - Cursor Based Implementation	Lab 8: Implementation of Queue using Array and linked list	Lab 11: Implementation of BST using linked list	Lab 14 :Implementation of Shortest path Algorithm
	SLO-2					

S-11	SLO-1	*Data Structures and its Types*	*Applications of Circular List -Joseph Problem*	*Circular Queue*	*B-Trees Constructions*	*Open Addressing*
	SLO-2	*Linear and Non-Linear Data Structures*	*Doubly Linked List*	*Implementation of Circular Queue*	*B-Trees Search*	*Linear Probing*
S-12	SLO-1	*1D, 2D Array Initialization using Pointers*	*Doubly Linked List Insertion*	*Applications of Queue*	*B-Trees Deletions*	*Quadratic probing*
	SLO-2	*1D, 2D Array Accessing usingPointers*	*Doubly Linked List Insertion variations*	*Double ended queue*	*Splay Trees*	*Double Hashing*
S-13	SLO-1	*Declaring Structure and accessing*	*Doubly Linked List Deletion*	*Priority Queue*	*Red Black Trees*	*Rehashing*
	SLO-2	*Declaring Arrays of Structures and accessing*	*Doubly Linked List Search*	*Priority Queue - Applications*	*Red Black Trees Insertion*	*Extensible Hashing*
S 14-15	SLO-1	*Lab 3: Implement Structures using Pointers*	*Lab 6: Implementation of Doubly linked List*	*Lab 9: Applications of Stack, Queue*	*Lab 12:Implementation of B-Trees*	*Lab 15 :Implementation of Minimal Spanning Tree*
	SLO-2					

Learning Resources	1. *Seymour Lipschutz, Data Structures with C, McGraw Hill, 2014* 2. *R.F.Gilberg, B.A.Forouzan, Data Structures, 2nd ed., Thomson India, 2005* 3. *A.V.Aho, J.E Hopcroft , J.D.Ullman, Data structures and Algorithms, Pearson Education, 2003* 4. *Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd ed., Pearson Education, 2015*	5. *Reema Thareja, Data Structures Using C, 1st ed., Oxford Higher Education, 2011* 6. *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
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	3. Dr.Noor Mahammad, IIITDM, Kancheepuram,noor@iiitdm.ac.in	*3. Ms. Ferni Ukrit, SRMIST*

Course Code	18CSC202J	Course Name	OBJECT ORIENTED DESIGN AND PROGRAMMING	Course Category	C	Professional Core	L	T	P	C
							3	0	2	4

Pre-requisite Courses	18CSS101J	Co-requisite Courses	Nil	Progressive Courses	18CSC207J
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 class and build domain model for real-time programs
CLR-2 :	Utilize method overloading and operator overloading for real-time application development programs
CLR-3 :	Utilize inline, friend and virtual functions and create application development programs
CLR-4 :	Utilize exceptional handling and collections for real-time object oriented programming applications
CLR-5 :	Construct UML component diagram and deployment diagram for design of applications
CLR-6 :	Create programs using object oriented approach and design methodologies for real-time application development

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 :	Identify the class and build domain model	3	80	70
CLO-2 :	Construct programs using method overloading and operator overloading	3	85	75
CLO-3 :	Create programs using inline, friend and virtual functions, construct programs using standard templates	3	75	70
CLO-4 :	Construct programs using exceptional handling and collections	3	85	80
CLO-5 :	Create UML component diagram and deployment diagram	3	85	75
CLO-6 :	Create programs using object oriented approach and design methodologies	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 :	H	H	M	-	-	-	-	-	H	H	-	-	M	H	H
CLO-2 :	H	H	H	H	H	-	M	-	H	H	-	-	M	H	H
CLO-3 :	H	H	M	H	H	-	M	-	H	H	-	-	M	H	H
CLO-4 :	H	H	H	-	-	-	-	-	H	M	-	-	M	H	H
CLO-5 :	H	M	M	M	M	M	M	-	H	H	-	M	M	H	H
CLO-6 :	H	H	M	-	-	-	-	-	H	H	-	-	M	H	H

Duration (hour)		15	15	15	15	15
S-1	SLO-1	Comparison of Procedural and Object Oriented Programming	Types of constructor (Default, Parameter)	Feature Inheritance: Single and Multiple	Generic - Templates : Introduction	STL: Containers: Sequence and Associative Container
	SLO-2	OOPS and its features	Static constructor and copy constructor	Inheritance: Multilevel	Function templates	
S-2	SLO-1	I/O Operations, Data Types, Variables, static	Feature Polymorphism: Constructor overloading	Inheritance: Hierarchical	Example programs Function templates	Sequence Container: Vector, List
	SLO-2	Constants, Pointers, Type Conversions	Method Overloading	Inheritance: Hybrid	Class Templates	Sequence Container: Deque, Array
S-3	SLO-1	Features: Class and Objects	Example for method overloading	Inheritance: Example Programs	Class Templates	STL : Stack
	SLO-2	UML Diagrams Introduction	Method Overloading: Different parameter with different return values		Example programs for Class and Function templates	
S 4-5	SLO-1	Lab 1: I/O operations	Lab 4: Constructor and Method overloading	Lab 7: Inheritance and its types	Lab 10: Templates	Lab 13: STL Containers
	SLO-2					
S-6	SLO-1	Feature :Class and Objects	Operator Overloading and types	Advanced Functions: Inline, Friend	Exceptional Handling: try and catch	Associative Containers: Map, Multimap
	SLO-2	Examples of Class and Objects	Overloading Assignment Operator	Advanced Functions: Virtual, Overriding	Exceptional Handling: Multilevel exceptional	
S-7	SLO-1	UML Class Diagram and its components	Overloading Unary Operators	Advanced Function: Pure Virtual function	Exceptional Handling: throw and throws	Iterator and Specialized iterator
	SLO-2	Class Diagram relations and Multiplicity	Example for Unary Operator overloading	Example for Virtual and pure virtual function	Exceptional Handling: finally	Functions of iterator
S-8	SLO-1	Feature Abstraction and Encapsulation	Overloading Binary Operators	Abstract class and Interface	Exceptional Handling: User defined exceptional	Algorithms: find(), count(), sort()
	SLO-2	Application of Abstraction and Encapsulation	Example for Binary Operator overloading	Example Program	Example Programs using C++	Algorithms: search(), merge()
S 9-10	SLO-1	Lab 2: Classes and Objects, Class Diagram	Lab 5: Polymorphism : Operators Overloading	Lab 8: Virtual Function and Abstract class	Lab 11: Exceptional Handling	Lab 15: STL Associative containers and algorithms
	SLO-2					
S-11	SLO-1	Access specifiers – public, private	UML Interaction Diagrams	UML State Chart Diagram	Dynamic Modeling: Package Diagram	Function Object : for_each(), transform()

	SLO-2	*Access specifiers - protected, friend, inline*	*Sequence Diagram*	*UML State Chart Diagram*	*UML Component Diagram*	*Example for Algorithms*
S-12	SLO-1	*UML use case Diagram, use case, Scenario*	*Collaboration Diagram*	*Example State Chart Diagram*	*UML Component Diagram*	*Streams and Files: Introduction*
	SLO-2	*Use case Diagram objects and relations*	*Example Diagram*	*UML Activity Diagram*	*UML Deployment Diagram*	*Classes and Errors*
S-13	SLO-1	*Method, Constructor and Destructor*	*Feature: Inheritance*	*UML Activity Diagram*	*UML Deployment Diagram*	*Disk File Handling Reading Data and Writing Data*
	SLO-2	*Example program for constructor*	*Inheritance and its types*	*Example Activity Diagram*	*Example Package, Deployment, Package*	
S 14-15	SLO-1	*Lab 3: Methods and Constructor, Usecase*	*Lab 6: UML Interaction Diagram*	*Lab 9: State Chart and Activity Diagram*	*Lab12 : UML Component, Deployment, Package diagram*	*Lab15: Streams and File Handling*
	SLO-2					

Learning Resources	1. *Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Object-Oriented Analysis and Design with Applications, 3rd ed., Addison-Wesley, May 2007* 2. *Reema Thareja, Object Oriented Programming with C++, 1st ed., Oxford University Press, 2015* 3. *Sourav Sahay, Object Oriented Programming with C++, 2nd ed., Oxford University Press, 2017*	4. *Robert Lafore, Object-Oriented Programming in C++, 4th ed., SAMS Publishing, 2008* 5. *Ali Bahrami, Object Oriented Systems Development", McGraw Hill, 2004* 6. *Craig Larmen, Applying UML and Patterns, 3rd ed., Prentice Hall, 2004*

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

For the laboratory component the students are advised to take an application and apply the concepts

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr. Girish Raghavan, Senior DMTS Member, Wipro Ltd.	*1. Dr. Srinivasa Rao Bakshi, IITM Chennai, sbakshi@iitm.ac.in*	*1. Ms. C.G.Anupama, SRMIST*
Ms. Thamilchelvi, Solutions Architect, Wipro Ltd	*2. Dr. Ramesh Babu, N, IITM Chennai, nrbabu@iitm.ac.in*	*2. Mr. C.Arun, SRMIST*
		3. Mr. Geogen George, SRMIST
		4. Mr. Muthukumaran, SRMIST

Course Code	18CSC203J	Course Name	COMPUTER ORGANIZATION AND ARCHITECTURE	Course Category	C	Professional Core	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	18CSC207J
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
CLR-2 :	Analyze the functions of arithmetic Units like adders, multipliers etc.
CLR-3 :	Understand the concepts of Pipelining and basic processing units
CLR-4 :	Study about parallel processing and performance considerations.
CLR-5 :	Have a detailed study on Input-Output organization and Memory Systems.
CLR-6 :	Simulate simple fundamental units like half adder, full adder etc

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 :	Identify the computer hardware and how software interacts with computer hardware	2	80	70
CLO-2 :	Apply Boolean algebra as related to designing computer logic, through simple combinational and sequential logic circuits	3	85	75
CLO-3 :	Analyze the detailed operation of Basic Processing units and the performance of Pipelining	2	75	70
CLO-4 :	Analyze concepts of parallelism and multi-core processors.	3	85	80
CLO-5 :	Identify the memory technologies, input-output systems and evaluate the performance of memory system	3	85	75
CLO-6 :	Identify the computer hardware, software and its interactions	3	85	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 :	H	H	-	-	-	-	-	-	M	L	-	M	-	-	-
CLO-2 :	H	H	H	-	H	-	-	-	M	L	-	M	-	-	-
CLO-3 :	H	H	H	H	-	-	-	-	M	L	-	M	-	-	-
CLO-4 :	H	-	-	H	-	-	-	-	M	L	-	M	-	-	-
CLO-5 :	H	-	H	H	-	-	-	-	M	L	-	M	-	-	-
CLO-6 :	H	H	H	H	H	-	-	-	M	L	-	M	-	-	-

Duration (hour)		15	15	15	15	15
S-1	SLO-1	Functional Units of a computer	Addition and subtraction of Signed numbers	Fundamental concepts of basic processing unit	Parallelism	Memory systems -Basic Concepts
	SLO-2	Operational concepts	Problem solving	Performing ALU operation	Need, types of Parallelism	Memory hierarchy
S-2	SLO-1	Bus structures	Design of fast adders	Execution of complete instruction, Branch instruction	applications of Parallelism	Memory technologies
	SLO-2	Memory locations and addresses	Ripple carry adder and Carry look ahead adder	Multiple bus organization	Parallelism in Software	RAM, Semiconductor RAM
S-3	SLO-1	Memory operations	Multiplication of positive numbers	Hardwired control	Instruction level parallelism	ROM,Types
	SLO-2	Memory operations	Problem Solving	Generation of control signals	Data level parallelism	Speed,size cost
S 4-5	SLO-1	Lab 1: To recognize various components of PC-***Input Output systems***	Lab4:Study of TASM	Lab-7: Design of Half Adder	Lab-10: Study of Array Multiplier	Lab-13: Study of Carry Save Multiplication
	SLO-2	Processing and Memor***y*** units	Addition and Subtraction of 8-bit number	Design of Full Adder	Design of Array Multiplier	Program to carry out Carry Save Multiplication
S-6	SLO-1	Instructions, Instruction sequencing	Signed operand multiplication	Micro-programmed control-	Challenges in parallel processing	Cache memory
	SLO-2	Addressing modes	Problem solving	Microinstruction	Architectures of Parallel Systems - Flynn's classification	Mapping Functions
S-7	SLO-1	Problem solving	Fast multiplication- Bit pair recoding of Multipliers	Micro-program Sequencing	SISD,SIMD	Replacement Algorithms
	SLO-2	Introduction to Microprocessor	Problem Solving	Micro instruction with Next address field	MIMD, MISD	Problem Solving
S-8	SLO-1	Introduction to Assembly language	Carry Save Addition of summands	Basic concepts of pipelining	Hardware multithreading	Virtual Memory
	SLO-2	Writing of assembly language programming	Problem Solving	Pipeline Performance	Coarse Grain parallelism, Fine Grain parallelism	Performance considerations of various memories

S 9-10	**SLO-1**	*Lab-2:To understand how different components of PC are connected to work properly*	*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*
	SLO-2	*Assembling of System Components*				
S-11	**SLO-1**	*ARM Processor: The thumb instruction set*	*Integer division – Restoring Division*	*Pipeline Hazards-Data hazards*	*Uni-processor and Multiprocessors*	*Input Output Organization*
	SLO-2	*Processor and CPU cores*	*Solving Problems*	*Methods to overcome Data hazards*	*Multi-core processors*	*Need for Input output devices*
S-12	**SLO-1**	*Instruction Encoding format*	*Non Restoring Division*	*Instruction Hazards*	*Multi-core processors*	*Memory mapped IO*
	SLO-2	*Memory load and Store instruction in ARM*	*Solving Problems*	*Hazards on conditional and Unconditional Branching*	*Memory in Multiprocessor Systems*	*Program controlled IO*
S-13	**SLO-1**	*Basics of IO operations.*	*Floating point numbers and operations*	*Control hazards*	*Cache Coherency in Multiprocessor Systems*	*Interrupts-Hardware, Enabling and Disabling Interrupts*
	SLO-2	*Basics of IO operations.*	*Solving Problems*	*Influence of hazards on instruction sets*	*MESI protocol for Multiprocessor Systems*	*Handling multiple Devices*
S 14-15	**SLO-1**	*Lab -3To understand how different components of PC are connected to work properly*	*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.*
	SLO-2	*Disassembling of System Components*				

Learning Resources	1. *Carl Hamacher, ZvonkoVranesic, SafwatZaky, Computer Organization, 5th ed., McGraw-Hill, 2015* 2. *Kai Hwang, Faye A. Briggs, Computer Architecture and Parallel Processing", 3rd ed., McGraw Hill, 2016* 3. *Ghosh T. K., Computer Organization and Architecture, 3rd ed., Tata McGraw-Hill, 2011* 4. *P. Hayes, Computer Architecture and Organization, 3rd ed., McGraw Hill, 2015.*	5. *William Stallings, Computer Organization and Architecture – Designing for Performance, 10th ed., Pearson Education, 2015* 6. *David A. Patterson and John L. Hennessy Computer Organization and Design - A Hardware software interface, 5th ed., Morgan Kaufmann,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
1. *T. V. Sankar, HCL Technologies Ltd, Chennai, sankar_t@hcl.com*	*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. Mrs M.S.Abirami, SRMIST

Course Code	18CSC204J	Course Name	DESIGN AND ANALYSIS OF ALGORITHMS	Course Category	C	Professional Core	L	T	P	C
							3	0	2	4

Pre-requisite Courses	18CSC201J, 18CSC202J	Co-requisite Courses	18CSC207J	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 :	Design efficient algorithms in solving complex real time problems			
CLR-2 :	Analyze various algorithm design techniques to solve real time problems in polynomial time			
CLR-3 :	Utilize various approaches to solve greedy and dynamic algorithms			
CLR-4 :	Utilize back tracking and branch and bound paradigms to solve exponential time problems			
CLR-5 :	Analyze the need of approximation and randomization algorithms, utilize the importance Non polynomial algorithms			
CLR-6 :	Construct algorithms that are efficient in space and time complexities			

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 efficient algorithms to reduce space and time complexity of both recurrent and non-recurrent relations	3	80	70	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-
CLO-2 :	Solve problems using divide and conquer approaches	3	85	75	M	H	L	M	L	-	-	-	M	L	-	H	-	-	-
CLO-3 :	Apply greedy and dynamic programming types techniques to solve polynomial time problems.	3	75	70	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-4 :	Create exponential problems using backtracking and branch and bound approaches.	3	85	80	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-5 :	Interpret various approximation algorithms and interpret solutions to evaluate P type, NP Type, NPC, NP Hard problems	3	85	75	H	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-6 :	Create algorithms that are efficient in space and time complexities by using divide conquer, greedy, backtracking technique	3	80	70	L	H	M	H	L	-	-	-	L	L	-	H	-	-	-

Duration (hour)		15	15	15	15	15
S-1	SLO-1	Introduction-Algorithm Design	Introduction-Divide and Conquer	Introduction-Greedy and Dynamic Programming	Introduction to backtracking - branch and bound	Introduction to randomization and approximation algorithm
	SLO-2	Fundamentals of Algorithms	Maximum Subarray Problem	Examples of problems that can be solved by using greedy and dynamic approach	N queen's problem - backtracking	Randomized hiring problem
S-2	SLO-1	Correctness of algorithm	Binary Search	Huffman coding using greedy approach	Sum of subsets using backtracking	Randomized quick sort
	SLO-2	Time complexity analysis	Complexity of binary search	Comparison of brute force and Huffman method of encoding	Complexity calculation of sum of subsets	Complexity analysis
S-3	SLO-1	Insertion sort-Line count, Operation count	Merge sort	Knapsack problem using greedy approach	Graph introduction	String matching algorithm
	SLO-2	Algorithm Design paradigms	Time complexity analysis	Complexity derivation of knapsack using greedy	Hamiltonian circuit - backtracking	Examples
S 4-5	SLO-1 / SLO-2	Lab 1: Simple Algorithm-Insertion sort	Lab 4: Quicksort, Binary search	Lab 7: Huffman coding, knapsack and using greedy	Lab 10: N queen's problem	Lab 13: Randomized quick sort
S-6	SLO-1	Designing an algorithm	Quick sort and its Time complexity analysis	Tree traversals	Branch and bound - Knapsack problem	Rabin Karp algorithm for string matching
	SLO-2	And its analysis-Best, Worst and Average case	Best case, Worst case, Average case analysis	Minimum spanning tree - greedy Kruskal's algorithm - greedy	Example and complexity calculation. Differentiate with dynamic and greedy	Example discussion
S-7	SLO-1	Asymptotic notations Based on growth functions.	Strassen's Matrix multiplication and its recurrence relation	Minimum spanning tree - Prims algorithm	Travelling salesman problem using branch and bound	Approximation algorithm
	SLO-2	$O, O, \Theta, \omega, \Omega$	Time complexity analysis of Merge sort	Introduction to dynamic programming	Travelling salesman problem using branch and bound example	Vertex covering
S-8	SLO-1	Mathematical analysis	Largest sub-array sum	0/1 knapsack problem	Travelling salesman problem using branch and bound example	Introduction Complexity classes
	SLO-2	Induction, Recurrence relations	Time complexity analysis of Largest sub-array sum	Complexity calculation of knapsack problem	Time complexity calculation with an example	P type problems
S 9-10	SLO-1 / SLO-2	Lab 2: Bubble Sort	Lab 5: Strassen Matrix multiplication	Lab 8: Various tree traversals, Krukshall's MST	Lab 11: Travelling salesman problem	Lab 14: String matching algorithms

S-11	SLO-1	*Solution of recurrence relations*	*Master Theorem Proof*	*Matrix chain multiplication using dynamic programming*	*Graph algorithms*	*Introduction to NP type problems*
	SLO-2	*Substitution method*	*Master theorem examples*	*Complexity of matrix chain multiplication*	*Depth first search and Breadth first search*	*Hamiltonian cycle problem*
S-12	SLO-1	*Solution of recurrence relations*	*Finding Maximum and Minimum in an array*	*Longest common subsequence using dynamic programming*	*Shortest path introduction*	*NP complete problem introduction*
	SLO-2	*Recursion tree*	*Time complexity analysis-Examples*	*Explanation of LCS with an example*	*Floyd-Warshall Introduction*	*Satisfiability problem*
S-13	SLO-1	*Solution of recurrence relations*	*Algorithm for finding closest pair problem*	*Optimal binary search tree (OBST)using dynamic programming*	*Floyd-Warshall with sample graph*	*NP hard problems*
	SLO-2	*Examples*	*Convex Hull problem*	*Explanation of OBST with an example.*	*Floyd-Warshall complexity*	*Examples*
S 14-15	SLO-1 SLO-2	*Lab 3: Recurrence Type-Merge sort, Linear search*	*Lab 6: Finding Maximum and Minimum in an array, Convex Hull problem*	*Lab 9: Longest common subsequence*	*Lab 12: BFS and DFS implementation with array*	*Lab 15: Discussion over analyzing a real time problem*

Learning Resources	1. *Thomas H Cormen, Charles E Leiserson, Ronald L Revest, Clifford Stein, Introduction to Algorithms, 3rd ed., The MIT Press Cambridge, 2014* 2. *Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd ed., Pearson Education, 2006*	3. *Ellis Horowitz, Sartajsahni, Sanguthevar, Rajesekaran, Fundamentals of Computer Algorithms, Galgotia Publication, 2010* 4. *S. Sridhar, Design and Analysis of Algorithms, Oxford University Press, 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 %		-	

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. G. Venkiteswaran, Wipro Technologies, gvenki@pilani.bits-pilani.ac.in	*1. MiteshKhapra, IITM Chennai, miteshk@cse.iitm.ac.in*	*1. Mr.K.Senthil Kumar, SRMIST*
2. Dr.SainarayananGopalakrishnan, HCL Technologies, sai.jgk@gmail.com	*2. V. Masilamani. IIITDM, masila@iiitdm.ac.in*	*2. Dr.A.Razia Sulthana, SRMIST*
		3. Mr. V. Sivakumar, SRMIST
		4. Ms. R. Vidhya, SRMIST

Course Code	18CSC205J	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 :	Introduce the key role of an Operating system			
CLR-2 :	Insist the Process Management functions of an Operating system			
CLR-3 :	Emphasize the importance of Memory Management concepts of an Operating system			
CLR-4 :	Realize the significance of Device Management part of an Operating system			
CLR-5 :	Comprehend the need of File Management functions of an Operating system			
CLR-6 :	Explore the services offered by the Operating system practically			

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 the need of an Operating system	1	80	70
CLO-2 :	Know the Process management functions of an Operating system	1	85	75
CLO-3 :	Understand the need of Memory Management functions of an Operating system	1	75	70
CLO-4 :	Find the significance of Device management role of an Operating system	2	85	80
CLO-5 :	Recognize the essentials of File Management part of an Operating system	2	85	75
CLO-6 :	Gain an insight of Importance of an Operating system through practical	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 :	Identify the need of an Operating system	H	H	H	H	H	M	L	M	H	M	M	H	H	H	M
CLO-2 :	Know the Process management functions of an Operating system	H	H	H	H	H	M	L	M	H	M	M	H	H	H	M
CLO-3 :	Understand the need of Memory Management functions of an Operating system	H	H	H	H	H	M	L	M	H	M	M	H	H	H	M
CLO-4 :	Find the significance of Device management role of an Operating system	H	H	H	H	H	M	L	M	H	M	M	H	H	H	M
CLO-5 :	Recognize the essentials of File Management part of an Operating system	H	H	H	H	H	M	L	M	H	M	M	H	H	H	M
CLO-6 :	Gain an insight of Importance of an Operating system through practical	H	H	H	H	H	M	L	M	H	M	M	H	H	H	M

Duration (hour)		15	15	15	15	15
S-1	SLO-1	Operating System Objectives and functions	PROCESS SYNCHRONIZATION : Peterson's solution, Synchronization Hardware	MEMORY MANAGEMENT: Memory Management: Logical Vs Physical address space, Swapping	VIRTUAL MEMORY– Background	STORAGE MANAGEMENT : Mass storage structure – Overview of Mass storage structure – Magnetic Disks
	SLO-2	Gaining the role of Operating systems	Understanding the two-process solution and the benefits of the synchronization hardware	Understanding the basics of Memory management	Understanding the need of demand paging	Understanding the Basics in storage management
S-2	SLO-1	The evolution of operating system, Major achievements	Process synchronization: Semaphores, usage, implementation	Contiguous Memory allocation – Fixed and Dynamic partition	VIRTUAL MEMORY – Basic concepts – page fault handling	Disk Scheduling
	SLO-2	Understanding the evolution of Operating systems from early batch processing systems to modern complex systems	Gaining the knowledge of the usage of the semaphores for the Mutual exclusion mechanisms	Getting to know about Partition memory management and issues: Internal fragmentation and external fragmentation problems	Understanding , how an OS handles the page faults	Understanding the various scheduling with respect to the disk
S-3	SLO-1	OS Design considerations for Multiprocessor and Multicore	Classical Problems of synchronization – Readers writers problem, Bounded Buffer problem	Strategies for selecting free holes in Dynamic partition	Performance of Demand paging	FILE SYSTEM INTERFACE: File concept, File access methods
	SLO-2	Understanding the key design issues of Multiprocessor Operating systems and Multicore Operating systems	Good understanding of synchronization mechanisms	Understanding the allocation strategies with examples	Understanding the relationship of effective access time and the page fault rate	Understanding the file basics
S 4-5	SLO-1	LAB 1 : Understanding the booting process of Linux	LAB4 : System admin commands – Basics	LAB7: Shell Programs – Basic level	LAB10 : Overlay concept	LAB13:Process synchronization
	SLO-2					
S-6	SLO-1	PROCESS CONCEPT– Processes, PCB	Classical Problems of synchronization – Dining Philosophers problem (Monitor)	Paged memory management	Copy-on write	File sharing and Protection
	SLO-2	Understanding the Process concept and Maintanance of PCB by OS	Understanding the synchronization of limited resources among multiple processes	Understanding the Paging technique.PMT hardware mechanism	Understanding the need for Copy-on write	Emphasis the need for the file sharing and its protection
S-7	SLO-1	Threads – Overview and its Benefits	CPU SCHEDULING : FCFS,SJF,Priority	Structure of Page Map Table	Page replacement Mechanisms: FIFO, Optimal, LRU and LRU approximation Techniques	FILE SYSTEM IMPLEMENTATION : File system structure
	SLO-2	Understanding the importance of threads	Understanding the scheduling techniques	Understanding the components of PMT	Understanding the Pros and cons of the	To get the basic file system structure

					page replacement techniques	
S-8	**SLO-1**	*Process Scheduling : Scheduling Queues, Schedulers, Context switch*	*CPU Scheduling: Round robin, Multilevel queue Scheduling, Multilevel feedback Scheduling*	*Example : Intel 32 bit and 64 –bit Architectures*	*Counting based page replacement and Page Buffering Algorithms*	*Directory Implementation*
	SLO-2	*Understanding basics of Process scheduling*	*Understanding the scheduling techniques*	*Understanding the Paging in the Intel architectures*	*To know on additional Techniques available for page replacement strategies*	*Understanding the various levels of directory structure*
S 9-10	**SLO-1**	*LAB2 : Understanding the Linux file system*	*LAB5: System admin commands – Simple task automations*	*LAB 8:Process Creation*	*LAB11: IPC using Pipes*	*LAB14 : Study of OS161*
	SLO-2					
S-11	**SLO-1**	*Operations on Process – Process creation, Process termination*	*Real Time scheduling: Rate Monotonic Scheduling and Deadline Scheduling*	*Example : ARM Architectures*	*Allocation of Frames - Global Vs Local Allocation*	*FILE SYSTEM IMPLEMENTATION :Allocation methods*
	SLO-2	*Understanding the system calls – fork(),wait(),exit()*	*Understanding the real time scheduling*	*Understanding the Paging with respect to ARM*	*Understanding the root cause of the Thrashing*	*Understanding the pros and Cons of various disk allocation methods*
S-12	**SLO-1**	*Inter Process communication : Shared Memory, Message Passing ,Pipe()*	*DEADLOCKS: Necessary conditions, Resource allocation graph, Deadlock prevention methods*	*Segmented memory management*	*Thrashing, Causes of Thrashing*	*FILE SYSTEM IMPLEMENTATION :Free space Management*
	SLO-2	*Understanding the need for IPC*	*Understanding the deadlock scenario*	*Understanding the users view of memory with respect to the primary memory*	*Understanding the Thrashing*	*Understanding the methods available for maintaining the free spaces in the disk*
S-13	**SLO-1**	*PROCESS SYNCHRONIZATION: Background, Critical section Problem*	*Deadlocks :Deadlock Avoidance, Detection and Recovery*	*Paged segmentation Technique*	*Working set Model*	*Swap space Management*
	SLO-2	*Understanding the race conditions and the need for the Process synchronization*	*Understanding the deadlock avoidance, detection and recovery mechanisms*	*Understanding the combined scheme for efficient management*	*Understanding the working set model for controlling the Working set Model*	*Understanding the Low-level task of the OS*
S 14-15	**SLO-1**	*LAB3: Understanding the various Phases of Compilation of a 'C' Program*	*LAB6 : Linux commands*	*LAB9: Overlay concept*	*LAB12: IPC using shared memory and Message queues*	*LAB15 : Understanding the OS161 filesystem and working with test programs*
	SLO-2					

Learning Resources	1. *Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating systems, 9th ed., John Wiley & Sons, 2013* 2. *William Stallings, Operating Systems-Internals and Design Principles, 7th ed., Prentice Hall, 2012*	3. *Andrew S.Tanenbaum, Herbert Bos, Modern Operating systems, 4th ed., Pearson, 2015* 4. *Bryant O'Hallaxn, Computer systems- A Programmer's Perspective,Pearson, 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 %		-	

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts	
1.Mr. Balamurugan, Infosys, balams@gmail.com	*1. Dr.Latha Parthiban, Pondicherry University, lathaparthiban@yahoo.com*	*1. Dr.G.Maragatham, SRMIST*	*3. Ms. Aruna S, SRMIST*
		2. Mr. Eliazer M, SRMIST	

Course Code	18CSC206J	Course Name	SOFTWARE ENGINEERING AND 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 Engineering	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	Familiarize the software life cycle models and software development process
CLR-2 :	Understand the various techniques for requirements, planning and managing a technology project
CLR-3 :	Examine basic methodologies for software design, development, testing, closure and implementation
CLR-4 :	Understand manage users expectations and the software development team
CLR-5 :	Acquire the latest industry knowledge, tools and comply to the latest global standards for project management

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 the process of project life cycle model and process	1	85	80
CLO-2 :	Analyze and specify software requirements through a productive working Relationship with project stakeholders	2	80	75
CLO-3 :	Design the system based on Functional Oriented and Object Oriented Approach for Software Design.	3	85	85
CLO-4 :	Develop the correct and robust code for the software products	3	85	85
CLO-5 :	Perform by applying the test plan and various testing techniques	2	85	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 :	H	H	L	-	-	-	L	-	H	H	M	M	-	-	-
CLO-2 :	H	H	H	H	H	-	M	-	H	H	H-	M	-	-	-
CLO-3 :	H	H	M	H	H	M	M	L	H	H	M	-	-	-	-
CLO-4 :	H	H	H	-	H	-	-	M	H	M	H	-	-	-	-
CLO-5 :	H	M	M	M	M	M	M	-	H	H	-	M	-	-	-

Duration (hour)		15	15	15	15	15
S-1	SLO-1	Introduction to Software Engineering	Software Design - Software Design Fundamentals	Software Construction	Introduction to testing	Product Release
	SLO-2	Software Project Management - life cycle activities	Design Standards - Design Type	Coding Standards	Verification	Product Release
S-2	SLO-1	Traditional – Waterfall, V Model	Design model – Architectural design, Software architecture	Coding Framework	Validation	Product Release Management
	SLO-2	Prototype, Spiral, RAD	Software Design Methods	Reviews - Desk checks (Peer Reviews)	Test Strategy	Product Release Management
S-3	SLO-1	Conventional – Agile,	Top Down , Bottom Up	Walkthroughs	Planning	Implementation
	SLO-2	XP, Scrum	Module Division (Refactoring)	Code Reviews, Inspections	Example: Test Strategy and Planning	Implementation
S 4-5	SLO-1	Lab1:Identify the Software Project, Create Business Case, Arrive at a Problem Statement	Lab 4:Prepare Project Plan based on scope, Find Job roles and responsibilities, Calculate Project effort based on resources	Lab 7:State and Sequence Diagram, Deployment Diagram, Sample Frontend Design (UI/UX)	Lab 10: Module Implementation (Phase 2), Scrum Master to Induce New Issues in Agile Development	Lab 13:Manual Testing
	SLO-2					
S-6	SLO-1	Introduction to Requirement Engineering	Module Coupling	Coding Methods	Test Project Monitoring and Control	User Training
	SLO-2	Requirements Elicitation	Component level design	Structured Programming	Test Project Monitoring and Control	Maintenance Introduction
S-7	SLO-1	Software Project Effort and cost estimation	User Interface Design	Object-Oriented Programming	Test Project Monitoring and Control	Maintenance Types - Corrective
	SLO-2	Cost estimation	Pattern oriented design	Automatic Code Generation	Test Project Monitoring and Control	Adaptive
S-8	SLO-1	Cocomo 1 and 2	Web application design	Automatic Code Generation	Test Project Monitoring and Control	Perfective
	SLO-2	Cocomo 1 and 2	Web application design	Automatic Code Generation	Test Project Monitoring and Control	Preventive
S 9-10	SLO-1	Lab 2:Stakeholder and User Description, Identify the appropriate Process Model, Comparative study with Agile Model	Lab 5:Prepare the Work, Breakdown Structure based on timelines, Risk Identification and Plan	Lab 8:Module Description, Module Implementation (phase 1) Using Agile	Lab 11:Module Implementation (Phase 3) Scrum Master to Induce New requirements in Agile Development, Scrum Master to Induce New Issues in Agile Development, Code Documentation	Lab 14:User Manual, Analysis of Costing, Effort and Resources
	SLO-2					
S-11	SLO-1	Risk Management	Design Reuse	Software Code Reuse	Design –Master test plan, types	Maintenance Cost
	SLO-2	Risk Management	Design Reuse	Software Code Reuse	Design –Master test plan, types	Maintenance Process
S-12	SLO-1	Configuration management	Concurrent Engineering in Software Design	Pair Programming	Test Case Management	life cycle
	SLO-2	Configuration management	Concurrent Engineering in Software Design	Test-Driven Development	Test Case Management	Software Release

S-13	SLO-1	*Project Planning – WBC, planning,*	*Design Life-Cycle Management*	*Configuration Management*	*Test Case Reporting*	*Software Maintenance*
	SLO-2	*scope, risk*	*Design Life-Cycle Management*	*Software Construction Artifacts*	*Test Case Reporting*	*Software Release, Software Maintenance*
S 14-15	SLO-1	*Lab 3:Identify the Requirements, System Requirements, Functional Requirements, Non-Functional Requirements*	*Lab 6:Design a System Architecture, Use Case Diagram, ER Diagram (Database), DFD Diagram (process) (Upto Level 1), Class Diagram (Applied For OOPS based Project), Collaboration Diagram (Applied For OOPS based Project) (Software – Rational Rose)*	*Lab 9:Module Implementation, Scrum Master to Induce New requirements in Agile Development*	*Lab 12:Master Test Plan, Test Case Design (Phase 1)*	*Lab 15: Project Demo and Report Submission with the team*
	SLO-2					

Learning Resources	1. *Roger S. Pressman, Software Engineering – A Practitioner Approach, 6th ed., McGraw Hill, 2005* 2. *Ian Sommerville, Software Engineering, 8th ed., Pearson Education, 2010* 3. *Rajib Mall, Fundamentals of Software Engineering, 4th ed., PHI Learning Private Limited, 2014* 4. *Ramesh, Gopalaswamy, Managing Global Projects, Tata McGraw Hill, 2005*	5. *Ashfaque Ahmed, Software Project Management: a process-driven approach, Boca Raton, Fla: CRC Press, 2012* 6. *Walker Royce, Software Project Management, Pearson Education, 1999* 7. *Jim Smith Agile Project Management: Creating Innovative Products,Pearson 2008*

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
1. Mr. Girish Raghavan, Wipro Technologies	*1. Dr. LathaParthiban, Pondicherry University, lathaparthiban@yahoo.com*	*1. Mrs. Sasi Rekha Sankar, SRMIST*
2. Dr.Mariappan Vaithilingam, *Amazon, Bangalore*	*2. V. Masilamani. IIITDM, masila@iiitdm.ac.in*	*2. Dr. T.S.Shiny Angel, SRMIST*
		3. Mr.N.Arivazhagan, SRMIST
		4. Mrs K.R.Jansi, SRMIST

Course Code	18CSC207J	Course Name	ADVANCED PROGRAMMING PRACTICE	Course Category	C	Professional Core	L	T	P	C
							3	0	2	4

Pre-requisite Courses	18CSC202J	Co-requisite Courses	18CSC204J	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 :	Create Real-time Application Programs using structured, procedural and object oriented programming paradigms
CLR-2 :	Create Real-time Application Programs using event driven, declarative and imperative programming paradigms
CLR-3 :	Create Real-time Application Programs using parallel, concurrent and functional programming paradigms
CLR-4 :	Create Real-time Application Programs using logic, dependent type and network programming paradigms
CLR-5 :	Create Real-time Application Programs using symbolic, automata based and graphical user interface program paradigm
CLR-6 :	Create Real-time Application Programs using different programming paradigms using python language

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 :	Create Programs using structured, procedural and object oriented programming paradigms	3	85	80	H	H	H	H	H	-	-	L	M	M	L	M	-	M	-
CLO-2 :	Create Programs using event driven, declarative and imperative programming paradigms	3	85	80	H	H	H	H	H	-	-	L	M	M	L	M	-	-	-
CLO-3 :	Create Programs using parallel, concurrent and functional programming paradigms	3	85	80	H	H	H	H	H	-	-	L	M	M	L	M	-	-	-
CLO-4 :	Create Programs using logic, dependent type and network programming paradigms	3	85	80	H	H	H	H	H	-	-	L	M	M	L	M	-	-	-
CLO-5 :	Create Programs using symbolic, automata based and graphical user interface programming paradigms	3	85	80	H	H	H	H	H	-	-	L	M	M	L	M	-	-	-
CLO-6 :	Create Programs using different programming paradigms using python language	3	85	80	H	H	H	H	H	-	-	L	M	M	L	M	-	-	-

Duration (hour)		15	15	15	15	15
S-1	SLO-1	Structured Programming Paradigm	Event Driven Programming Paradigm	Parallel Programming Paradigm	Logic Programming Paradigm	Symbolic Programming Paradigm
	SLO-2	Programming Language Theory	Event Object, handler, bind	Multi-threading, Multi-Processing	First-class function, Higher-order function, Pure functions, Recursion	Symbolic Maths, algebraic manipulations, limits, differentiation, integration, series
S-2	SLO-1	Bohm-Jacopini structured program theorem	Keypress events, Mouse events	Serial Processing, Parallel Processing	Packages: Kanren, SymPy	SymPy usage for symbolic maths
	SLO-2	Sequence, selection, decision, iteration, recursion	Automatic events from a timer	Multiprocessing module in Python	PySWIP, PyDatalog	Equation Solving, Matrices
S-3	SLO-1	Other languages: C, C++, Java, C#, Ruby	Other languages: Algol, Javascript, Elm	Process class, Pool class	Other languages: Prolog, ROOP, Janus	Other languages: Aurora, LISP, Wolfram
	SLO-2	Demo: Structured Programing in Python	Demo: Event Driven Programming in Python	Demo: Parallel Programming in Python	Demo: Logic Programming in Python	Demo: Symbolic Programming in Python
S 4-5	SLO-1 / SLO-2	Lab 1: Structured Programming	Lab 4: Event Driven Programming	Lab 7: Parallel Programming	Lab 10: Logic Programming	Lab 13: Symbolic Programming
S-6	SLO-1	Procedural Programming Paradigm	Declarative Programming Paradigm	Concurrent Programming Paradigm	Dependent Type Programming Paradigm	Automata Based Programming Paradigm
	SLO-2	Routines, Subroutines, functions	Sets of declarative statements	Parallel Vs Concurrent Programming	Logic Quantifier: for all, there exists	Finite State Machine, deterministic finite automation (dfa), nfa
S-7	SLO-1	Using Functions in Python	Object attribute, Binding behavior	threading, multiprocessing	Dependent functions, dependent pairs	State transitions using python-automaton
	SLO-2	logical view, control flow of procedural programming in various aspects	Creating Events without describing flow	concurrent.futures, gevent, greenlets, celery	Relation between data and its computation	Initial state, destination state, event (transition)
S-8	SLO-1	Other languages: Bliss, ChucK, Matlab	Other languages: Prolog, Z3, LINQ, SQL	Other languages: ANI, Plaid	Other Languages: Idris, Agda, Coq	Other languages: Forth, Ragel, SCXML
	SLO-2	Demo: creating routines and subroutines using functions in Python	Demo: Declarative Programming in Python	Demo:Concurrent Programming in Python	Demo:Dependent Type Programming in Python	Demo: Automata Based Programming in Python
S 9-10	SLO-1 / SLO-2	Lab 2: Procedural Programming	Lab 5: Declarative Programming	Lab 8: Concurrent Programming	Lab 11: Dependent Type Programming	Lab 14: Automata Programming
S-11	SLO-1	Object Oriented Programming Paradigm	Imperative Programming Paradigm	Functional Programming Paradigm	Network Programming Paradigm	GUI Programming Paradigm
	SLO-2	Class, Objects, Instances, Methods	Program State, Instructions to change the program state	Sequence of Commands	Socket Programming: TCP & UDP Connection oriented, connectionless	Graphical User Interface (GUI)

S-12	**SLO-1**	*Encapsulation, Data Abstraction*	*Combining Algorithms and Data Structures*	*map(), reduce(), filter(), lambda*	*Sock_Stream, Sock_Dgram, socket(), bind(), recvfrom(), sendto(), listen()*	*Tkinter, WxPython, JPython*
	SLO-2	*Polymorphism, Inheritance*	*Imperative Vs Declarative Programming*	*partial, functools*	*Server-Client; send(), recv(), connect(), accept(), read(), write(), close()*	*WxWidgets, PyQT5*
S-13	**SLO-1**	*Constructor, Destructor*	*Other languages: PHP, Ruby, Perl, Swift*	*Other languages:F#, Clojure, Haskell*	*Other languages: PowerShell, Bash, TCL*	*Other languages: GTK, java-gnome*
	SLO-2	*Example Languages: BETA, Cecil, Lava Demo: OOP in Python*	*Demo: Imperative Programming in Python*	*Demo: Functional Programming in Python*	*Demo: Socket Programming in Python*	*Demo: GUI Programming in Python*
S 14-15	**SLO-1**	*Lab 3: Object Oriented Programming*	*Lab 6: Imperative Programming*	*Lab 9: Functional Programming*	*Lab 12: Network Programming*	*Lab 15: GUI Programming*
	SLO-2					

Learning Resources	1. *Elad Shalom, A Review of Programming Paradigms throughout the History: With a suggestion Toward a Future Approach, Kindle Edition, 2018* 2. *John Goerzen, Brandon Rhodes, Foundations of Python Network Programming: The comprehensive guide to building network applications with Python, 2nd ed., Kindle Edition, 2010* 3. *Elliot Forbes, Learning Concurrency in Python: Build highly efficient, robust and concurrent applications, Kindle Edition, 2017*	4. *Amit Saha, Doing Math with Python: Use Programming to Explore Algebra, Statistics, Calculus and More, Kindle Edition, 2015* 5. *Alan D Moore, Python GUI Programming with Tkinter: Develop responsive and powerful GUI applications with Tkinter, Kindle Edition, 2018* 6. *https://www.scipy-lectures.org/*

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
1. Mr. Sagar Sahani, Amadeus Software Labs, Bangalore, hello.sagarsahni@gmail.com	*1. Dr. Rajeev Sukumaran, IIT Madras, rajeev@wmail.iitm.ac.in*	*1.Dr. R. Annie Uthra, SRMIST*
2. Mr. Janmajay Singh, Fuji Xerox R&D, Japan, janmajaysingh14@gmail.com	*2.Prof. R. Golda Brunet, GCE, goldabrunet@gcessalem.edu.in*	*2. Dr. Christhu Raj M R, SRMIST*
		3. Ms. K. Sornalakshmi, SRMIST
		4. Mr. C. Arun, SRMIST

Course Code	18CSC301T	Course Name	FORMAL LANGUAGE AND AUTOMATA	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:*

		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 :	*Utilize the mathematics and engineering principles for the basics of Formal Language*																		
CLR-2 :	*Acquire knowledge of Automata and minimize with Regular language's*																		
CLR-3 :	*Acquire knowledge of Context free Grammar and simplify using normal forms*																		
CLR-4 :	*Gain knowledge to push down automata and apply it with CFL*																		
CLR-5 :	*Analyze the methods of turning machine*																		
CLR-6 :	*Analyze and Design the methods of computational complexity*																		
Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*																		
CLO-1 :	*Acquire the knowledge of mathematics and engineering principles for the basics of Formal Language*				*M*	*H*	-	*H*	*L*	-	-	-	*L*	*L*	-	*H*	-	-	-
CLO-2 :	*Acquire the ability to identify specification of a Regular language's with Automata*				*M*	*H*	*L*	*M*	*L*	-	-	-	*M*	*L*	-	*H*	-	-	-
CLO-3 :	*Acquire knowledge of Context free Grammar and simplify using normal forms*				*M*	*H*	*M*	*H*	*L*	-	-	-	*M*	*L*	-	*H*	-	-	-
CLO-4 :	*Understand the concepts of push down automata and CFL .*				*M*	*H*	*M*	*H*	*L*	-	-	-	*M*	*L*	-	*H*	-	-	-
CLO-5 :	*Apply the knowledge to turning machine and its methods*				*H*	*H*	*M*	*H*	*L*	-	-	-	*M*	*L*	-	*H*	-	-	-
CLO-6 :	*Design the computational and acceptor machines using FA, PDA and Turing machines*				*L*	*H*	-	*H*	*L*	-	-	-	*L*	*L*	-	*H*	-	-	-

Duration (hour)		**11**	**9**	**9**	**9**	**7**
S-1	SLO-1	*Introduction to Automaton*	*Grammars: Introduction: Types of Grammar*	*Pushdown Automata: Definitions Moves*	*Turing Machines: Introduction*	*Undecidability :Basic definitions*
	SLO-2	*Mathematical concepts*	*Context Free Grammars and Languages*	*Instantaneous descriptions*	*Formal definition of Turing machines, Instantaneous descriptions*	*Decidable problems,*
S-2	SLO-1	*Formal Languages: Strings, Languages, Properties*	*Derivations*	*Deterministic pushdown automata*	*Turing Machine as Acceptors*	*Examples of undecidable problems and Problems*
	SLO-2	*Finite Representation : Regular Expressions*	*Ambiguity*	*Problems related to DPDA*	*Problems related to turning machine as Acceptors*	*Rice's Theorem*
S-3	SLO-1	*Problems related to regular expressions*	*Relationship between derivation and derivation trees*	*Non - Deterministic pushdown automata*	*Problems related to turning machine as Acceptors*	*Undecidable problems about Turing Machine- Post's Correspondence Problem*
	SLO-2	*Finite Automata :Deterministic Finite Automata*	*Problems related to Context free Grammar*	*Problems related to NDPDA*		*Problems related to Post's Correspondence Problem*
S-4	SLO-1	*Nondeterministic Finite Automata*	*Simplification of CFG : Elimination of Useless Symbols*	*Problems related to DPDA and NDPDA*	*Turing Machine as a Computing Device*	*Properties of Recursive and Recursively enumerable languages*
	SLO-2	*Finite Automaton with €- moves*			*Problems related to turning Turing Machine as a Computing Device*	
S-5	SLO-1	*Problems related to Deterministic and Nondeterministic Finite Automata*	*Simplification of CFG : Unit productions*	*Pushdown automata to CFL Equivalence*	*Problems related to turning Turing Machine as a Computing Device*	*Introduction to Computational Complexity: Definitions*
	SLO-2	*Problems related to Finite Automaton with €- moves*	*Simplification of CFG : Null productions*	*Problems related to Equivalence of PDA to CFG*		*Time and Space complexity of TMs*
S-6	SLO-1	*Equivalence of NFA and DFA*	*Problems related to Simplification of CFG*	*Problems related to Equivalence of PDA to CFG*	*Techniques for Turing Machine Construction*	*Complexity classes: Class P, Class NP*
	SLO-2	*Heuristics to Convert NFA to DFA*				
S-7	SLO-1	*Equivalence of NDFA's with and without €-moves*	*Chomsky normal form*	*CFL to Pushdown automata Equivalence*	*Considering the state as a tuple Considering the tape symbol as a tuple*	*Complexity classes: Introduction to NP-Hardness*
	SLO-2	*Problems related Equivalence of NDFA's with and without €-moves*	*Problems related to CNF*	*Problems related to Equivalence of CFG to PDA*	*Checking off symbols*	*NP Completeness*
S-8	SLO-1	*Minimization of DFA*	*Greiback Normal form*	*Pumping lemma for CFL*	*Modifications of Turing Machine*	
	SLO-2	*Problems related to Minimization of DFA*			*Multi-tape Turing Machine*	

S-9	SLO-1	*Regular Languages : Equivalence of Finite Automata and Regular Languages*	*Problems related to GNF*	*Problems based on pumping Lemma*	*Non-Deterministic Turing Machine*	
	SLO-2	*Equivalence of Finite Automata and Regular Grammars*			*Semi-Infinite Tape Turing Machine*	
S-10	SLO-1	*Problems related to Equivalence of Finite Automata and Regular Languages and Regular Grammars*				
	SLO-2	*Variants of Finite Automata :Two-way Finite Automaton Mealy Machines*				
S-11	SLO-1	*Properties of Regular Languages: Closure Properties*				
	SLO-2	*Set Theoretic Properties & Other Properties*				
	SLO-3	*Pumping Lemma*				

Learning Resources	1.Hopcroft J.E., Motwani R. and Ullman J.D, "Introduction to Automata Theory, Languages and Computations", Second Edition, Pearson Education, 2008. 2. Michael Sipser, "Introduction to the Theory of Computation" Cengage Learning, 2012.	*4*..John.C.Martin, "Introduction to Languages and the Theory of Computation" McGraw-Hill Education, 01- May-2010. 5. Kamala Krithivasan, Rama.R," Introduction to Formal Languages, Automata Theory and Computation", Pearson Education India, 01-Sep-2009. 6. Peter Linz , "An introduction to formal languages and automata", Jones & Bartlett Learning, 2001.

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
		Dr.R.AnnieUthra
		Dr.Jeyasudha

Course Code	18CSC302J	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 Engineering	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	Understand the evolution of computer networks using the layered network architecture
CLR-2 :	Understand the addressing concepts and learn networks devices
CLR-3 :	Design computer networks using subnetting and routing concepts
CLR-4 :	Understand the error types , framing, flow control
CLR-5 :	Understand the various Medium Access Control techniques and also the characteristics of physical layer functionalities
CLR-6 :	Understand basic network administration

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
		LevelofThinking (Bloom)	ExpectedProficiency (%)	Expected Attainment(%)	EngineeringKnowledge	ProblemAnalysis	Design&Development	Analysis,Design, Research	ModernTool Usage	Society&Culture	Environment& Sustainability	Ethics	Individual & TeamWork	Communication	ProjectMgt.&Finance	LifeLongLearning	PSO-1	PSO-2	PSO-3
CLO-1 :	Acquire the basics of computer network and its architecture	3	80	70	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-
CLO-2 :	Acquire the knowledge of various networks devices and addressing methods	3	85	75	M	H	L	M	L	-	-	-	M	L	-	H	-	-	-
CLO-3 :	Abilty to design the network routing methods	3	75	70	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-4 :	Acquire the various error codes and framing concepts	3	85	80	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-5 :	Ability to understand the physical layer functions and components	3	85	75	H	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-6 :	Ability to design a computer network using a switch and router	3	80	70	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-

Duration (hour)		15	15	15	15	15
S-1	SLO-1	Evolution of Computer Networks	*Addressing types*	*Network layer functionalities*	*Introduction- error types*	*Physical layer overview*
	SLO-2	*The Internet today*	*Physical, logical, port, specific addresses*	*Delivery vs Forwarding*	*Detection vs Correction*	*Functionalities*
S-2	SLO-1	*Data communications*	*IPv4 addresses*	*Unicast routing protocols*	*Error detection*	*Analog and digital*
	SLO-2	*Components*	*Notations*	*Intra , inter domain routing*	*Parity*	*Data, signals*
S-3	SLO-1	*Networks*	*Classful addressing*	*Multicast routing protocols*	*CRC*	*Transmission impairment*
	SLO-2	*Physical structures*	*Categories*	*Applications*	*Checksum*	*Attenuation, Distortion, Noise*
S 4-5	SLO-1	*Lab 1: Introduction to Packet racer*	*Lab 4* :IP Addressing and subnetting (VLSM).	*Lab 7 :* Implementation of Static Routing	*Lab 10: Implementation of* EIGRP Configuration	*Lab 13: Implementation of* Single-Area OSPF Link Costs and Interface
	SLO-2					
S-6	SLO-1	*Network models*	*Classless addressing*	*Distance vector routing*	*Error correction*	*Performance metrics*
	SLO-2	*Categories of network*	*Prefix usage*	*Node instability issues*	*Hamming code*	*Bandwidth, delay, throughput, jitter*
S-7	SLO-1	*Protocols and standards*	*Network Address Translation(NAT)*	*RIPv1*	*Framing*	*Wireless 802.11*
	SLO-2	*Standards organizations*	*Translation table*	*RIPv2*	*Flow control*	*Addressing mechanism*

S-8	SLO-1	*Layered tasks*	*IPv6 addresses*	*Link state routing*	*Error control*	Transmission Media
	SLO-2	*Hierarchy*	*Types, Notation*	*Dijkstra's Algorithm*	*ARQ types*	Twisted pair, Coaxial, Fibre
S 9-10	SLO-1 SLO-2	*Lab 2: Implementation of various Topology creation*	*Lab 5:* Configuring Interfaces	*Lab 8: Implementation of* Default Routing	*Lab 11: Implementation of EIGRP* Bandwidth and Adjacencies	*Lab 14 :Implementation of* Multi-Area OSPF with Stub Areas and Authentication
S-11	SLO-1	*OSI model*	*VLSM*	*OSPF*	*Random access*	IEEE 802.15
	SLO-2	*Layered approach, Peer-peer approach*	*Masking*	*EIGRP*	*ALOHA*	*Architecture*
S-12	SLO-1	*Layers in the OSI model*	*CIDR*	*Path vector routing*	*CSMA/CD*	IEEE 802.15.4
	SLO-2	*Comparison of layers*	*Address aggregation*	*Stabilized routing table creation for AS*	*CSMA/CA*	*Architecture*
S-13	SLO-1	*TCP/IP protocol suite*	*Networking devices*	*BGP*	*Controlled access*	IEEE 802.16
	SLO-2	*Comparison with OSI moldel*	*Router, Switch, hub, Bridges*	*BGP Sessions*	*Channelization*	*Architecture*
S 14-15	SLO-1 SLO-2	*Lab 3: Implement the categories of network(LAN,MAN,WAN)*	*Lab 6:* Basic Router Configuration, Creating Passwords	*Lab 9: Implementation of RIPv1, v2*	*Lab 12:Implementation of* EIGRP Authentication and Timers	*Lab 15 :* Redistribution Between EIGRP and OSPF

Learning Resources	1. BehrouzA.Forouzan,"DataCommunicationsandNetworking"5th edition,July1,2010,ISBN: 9780073376226. 2. ToddLammle,"CCNAStudyGuide",Edition7,2011, ISBN:13:9780470901076. 3. WilliamStallings,"DataandComputerCommunications",Edition9,2010.	

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 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
1.. Dr. Sricharan, Wipro Technologies, Chennai	*1. Dr.Noor Mahammad, IIITDM, Kancheepuram, noor@iiitdm.ac.in*	*1. Mr. K. Venkatesh, SRMIST*
2.	*2.*	*2. Ms.D. Anitha, SRMIST*
	3.	*3. Ms. Ferni Ukrit, SRMIST*

Course Code	18CSC303J	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:	Learning		
		1	2	3
CLR-1 :	Understand the fundamentals of Database Management Systems, Architecture and Languages	LevelofThinking (Bloom)	ExpectedProficiency (%)	ExpectedAttainment(%)
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:*			
CLO-1 :	Acquire the knowledge on DBMS Architecture and Languages	3	80	70
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
CLO-3 :	Apply the method to convert the ER model to a database schemas based on the conceptual relational model	3	75	70
CLO-4 :	Apply the knowledge to create, store and retrieve data using Structure Query Language (SQL) and PL/SQL	3	85	80
CLO-5 :	Apply the knowledge to improve database design using various normalization criteria and optimize queries	3	85	75
CLO-6 :	Appreciate the fundamental concepts of transaction processing- concurrency control techniques and recovery procedures.	3	85	75

Program Learning Outcomes (PLO)														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
EngineeringKnowledge	Problem Analysis	Design&Development	Analysis,Design,Research	ModernTool Usage	Society&Culture	Environment& Sustainability	Ethics	Individual & TeamWork	Communication	ProjectMgt.&Finance	LifeLongLearning	PSO-1	PSO-2	PSO – 3
H	M	L	L	-	-	-	-	L	L	L	H	-	-	-
H	H	H	H	H	-	-	-	H	H	H	H	-	-	-
H	H	H	H	H	-	-	-	H	H	H	H	-	-	-
H	H	H	H	H	-	-	-	H	H	H	H	-	-	-
H	H	L	M	L	-	-	-	M	M	M	L	-	-	-
H	L	L	L	L	-	-	-	H	L	L	L			

Duration (hour)		15	15	15	15	15
S-1	SLO-1	What is Database Management System	Database Design	Basics of SQL-DDL,DML,DCL,TCL	Relational Algebra – Fundamental Operators and syntax, relational algebra queries, Tuple relational calculus	Transaction concepts, properties of transactions,
	SLO-2	Advantage of DBMS over File Processing System	Design process	Structure Creation, alternation		
S-2	SLO-1	Introduction and applications of DBMS	Entity Relation Model	Defining Constraints-Primary Key, Foreign Key, Unique, not null, check, IN operator		serializability of transactions,
	SLO-2	Purpose of database system				testing for serializability, System recovery,
S-3	SLO-1	Views of data	ER diagram	Functions-aggregation functions	Pitfalls in Relational database, Decomposing bad schema	Concurrency Control
	SLO-2			Built-in Functions-numeric, date, string functions, string functions, Set operations,	Functional Dependency – definition, trivial and non-trivial FD	
S 4-5	SLO-1	Lab 1: SQL Data Definition Language Commands on sample exercise	Lab4 : 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	* The abstract of the project to construct database must be framed		* Frame and execute the appropriate DDL,DML,DCL,TCL for the project	* Frame and execute the appropriate Join Queries for the project	* Frame and execute the appropriate PL/SQL Procedures and Functions for the project
S-6	SLO-1	Database system Architecture	Keys , Attributes and Constraints	Sub Queries, correlated sub queries	closure of FD set , closure of attributes	Two- Phase Commit protocol, Recovery and Atomicity
	SLO-2				irreducible set of FD	
S-7	SLO-1	Data Independence	Mapping Cardinality	Nested Queries, Views and its Types	Normalization – 1Nf, 2NF, 3NF,	Log-based recovery
	SLO-2					
S-8	SLO-1	The evolution of Data Models	Extended ER - Generalization,	Transaction Control Commands	Decomposition using FD- dependency	concurrent executions of transactions and

	SLO-2		*Specialization and Aggregation*	*Commit, Rollback, Savepoint*	*preservation,*	*related problems*
S 9-10	SLO-1 SLO-2	*Lab 2: SQL Data Manipulation Language Commands* ** Identification of project Modules and functionality*	*Lab 5: Construct a ER Model for the application to be constructed to a Database*	*Lab 8: Set Operators & Views.* ** Frame and execute the appropriate In-Built functions for the project*	*Lab 11: PL/SQL Functions* ** Frame and execute the appropriate Set Operators & Views for the project*	*Lab 14: PL/SQL Trigger* ** Frame and execute the appropriate PL/SQL Cursors and Exceptional Handling for the project*
S-11	SLO-1 SLO-2	*Degrees of Data Abstraction*	*ER Diagram Issues* *Weak Entity*	*PL/SQL Concepts- Cursors*	*BCNF*	*Locking mechanism, solution to concurrency related problems*
S-12	SLO-1 SLO-2	*Database Users and DBA*	*Relational Model*	*Stored Procedure, Functions Triggers and Exceptional Handling*	*Multi- valued dependency,* *4NF*	*Deadlock*
S-13	SLO-1 SLO-2	*Database Languages*	*Conversion of ER to Relational Table*	*Query Processing*	*Join dependency and 5NF*	*two-phase locking protocol, Isolation, Intent locking*
S 14-15	SLO-1 SLO-2	*Lab 3: SQL Data Control Language Commands and Transaction control commands to the sample exercises* ** Identify the issues that can arise in a business perspective for the application*	*Lab 6: Nested Queries on sample exercise* ** Construction of Relational Table from the ER Diagram*	*Lab9: PL/SQL Conditional and Iterative Statements* ** Frame and execute the appropriate Nested Queries for the project*	*Lab 12: PL/SQL Cursors* ** Frame and execute the appropriate PL/SQL Conditional and Iterative Statements for the project*	*Lab 15 : * Frame and execute the appropriate PL/SQL Cursors and Exceptional Handling for the project* ** Demo of the project*

Learning Resources

1. *Abraham Silberschatz, Henry F. Korth, S. Sudharshan, Database System Concepts‖, Sixth Edition, Tata McGraw Hill,2011.*
2. *Ramez Elmasri, Shamkant B. Navathe, Fundamentals of Database Systems‖, Sixth Edition, Pearson Education,2011.*
3. *CJ Date,A Kannan,S Swamynathan, An Introduction to Database Systems, Eight Edition, Pearson Education,2006.*
4. *Rajesh Narang, Database Management Systems, 2nd ed., PHI Learning Private Limited,2011.*
4. *Martin Gruber, Understanding SQL, Sybex,1990*
5. *SharadMaheshwari,IntroductiontoSQLandPL/SQL,2d ed.,LaxmiPublications,2016.*
6. *RaghuramaKrishnan,JohannesGehrke,DatabaseManagementSystems,3rdEdition,McGrawHill Education,2003.*

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, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr.Mariappan Vaithilingam, Engineering Leader *Amazon, dr.v.m@ieee.org*		*1. Ms. Sasi Rekha Sankar SRMIST*
2. Mr. Badinath, SDET, Amzon, sbadhrinath@gmail.com		*2. Mr.Elizer, SRMIST*
		3. Mrs. Hemavathy, SRMIST

Course Code	18CSC304J	Course Name	COMPILER DESIGN	Course Category	C	Professional Core	L	T	P	C
							3	0	2	4

Pre-requisite Courses	18CSC301T	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 mathematics and engineering principles for the Design of Compilers
CLR-2 :	Acquire knowledge of Lexical Analyzer from a specification of a language's lexical rules
CLR-3 :	Acquire knowledge of Syntax Analyzer for parsing the sentences in a compiler grammar
CLR-4 :	Gain knowledge to translate a system into various intermediate codes
CLR-5 :	Analyze the methods of implementing a Code Generator for compilers
CLR-6 :	Analyze and Design the methods of developing a Code Optimizer

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
		LevelofThinking (Bloom)	ExpectedProficiency (%)	ExpectedAttainment(%)	EngineeringKnowledge	ProblemAnalysis	Design&Development	Analysis,Design, Research	ModernTool Usage	Society&Culture	Environment& Sustainability	Ethics	Individual & TeamWork	Communication	ProjectMgt.&Finance	LifeLongLearning	PSO-1	PSO-2	PSO– 3
CLO-1 :	Acquire the knowledge of mathematics and engineering principles for the Design of Compilers	3	80	70	H	H	H	H	M	L	L	L	M	M	L	H	H	H	H
CLO-2 :	Acquire the ability to identify specification of a language's lexical rules of Lexical Analyzer	3	85	75	H	H	H	H	M	L	L	L	M	M	L	H	H	H	H
CLO-3 :	Apply the knowledge of Syntax Analyzer for parsing the sentences in a compiler grammar	3	75	70	H	H	H	H	M	L	L	L	M	M	L	H	H	H	H
CLO-4 :	Understand the concepts of translation of various intermediate codes .	3	85	80	H	H	H	H	M	L	L	L	M	M	L	H	H	H	H
CLO-5 :	Apply the knowledge to implement Code Generator for compilers	3	85	75	H	H	H	H	M	L	L	L	M	M	L	H	H	H	H
CLO-6 :	Analyze and Design the methods of developing a Code Optimizer	3	80	70	H	H	H	H	M	L	L	L	M	M	L	H	H	H	H

Duration (hour)		15	15	15	15	15
S-1	SLO-1	Compilers – Analysis of the source program	Syntax Analysis Definition - Role of parser	Bottom Up Parsing	Intermediate Code Generation	Code optimization
	SLO-2	Phases of a compiler – Cousins of the Compiler	Lexical versus Syntactic Analysis	Reductions	Intermediate Languages - prefix - postfix	Introduction– Principal Sources of Optimization
S-2	SLO-1	Grouping of Phases – Compiler construction tools	Representative Grammars	Handle Pruning	Quadruple - triple - indirect triples Representation	Function Preserving Transformation
	SLO-2	Lexical Analysis – Role of Lexical Analyzer	Syntax Error Handling	Shift Reduce Parsing	Syntax tree- Evaluation of expression - three-address code	Loop Optimization
S-3	SLO-1	Input Buffering	Elimination of Ambiguity, Left Recursion	Problems related to Shift Reduce Parsing	Synthesized attributes – Inherited attributes	Optimization of basic Blocks
	SLO-2	Specification of Tokens	Left Factoring	Conflicts During Shift Reduce Parsing	Intermediate languages – Declarations	Building Expression of DAG
S 4-5	SLO-1 SLO-2	Lab 1 - Implementation of Lexical Analyzer	Lab 4Elimation of Ambiguity, Left Recursion and Left Factoring	Lab 7 - Shift Reduce Parsing	Lab 10-Intermediate code generation – Postfix, Prefix	Lab 13 Implementation of DAG
S-6	SLO-1	Finite automation - deterministic	Top down parsing	LR Parsers- Why LR Parsers	Assignment Statements	Peephole Optimization
	SLO-2	Finite automation - non deterministic	Recursive Descent Parsing,back tracking	Items and LR(0) Automaton, Closure of Item Sets,	Boolean Expressions, Case Statements	Basic Blocks, Flow Graphs
S-7	SLO-1	Transition Tables	Computation of FIRST	LR Parsing Algorithm	Back patching – Procedure calls	Next -Use Information

	SLO-2	*Acceptance of Input Strings by Automata*	*Problems related to FIRST*	*Operator Precedence Parser Computation of LEADING*	*Code Generation*	*Introduction to Global Data Flow Analysis*
S-8	SLO-1	*State Diagrams and Regular Expressions*	*Computation of FOLLOW*	*Computation of TRAILING*	*Issues in the design of code generator*	*Computation of gen and kill*
	SLO-2	*Conversion of regular expression to NFA – Thompson's*	*Problems related to FOLLOW*	*Problems related to LEADING AND TRAILING*	*The target machine – Runtime Storage management*	*Computation of in and out*
S 9-10	SLO-1 SLO-2	*Lab 2 conversion from Regular Expression to NFA*	*Lab 5 -FIRST AND FOLLOW computation*	*Lab 8- Computation of LEADING AND TRAILING*	*Lab 11 Intermediate code generation – Quadruple, Triple, Indirect triple*	*Lab 14 : Implementation of Global Data Flow Analysis*
S-11	SLO-1	*Conversion of NFA to DFA*	*Construction of a predictive parsing table*	*SLR Grammars*	*A simple Code generator*	*Parameter Passing.*
	SLO-2	*Simulation of an NFA*	*Predictive Parsers LL(1) Grammars*	*SLR Parsing Tables*	*Code Generation Algorithm*	*Runtime Environments*
S-12	SLO-1	*Converting Regular expression directly to DFA*	*Transition Diagrams for Predictive Parsers*	*Problems related to SLR*	*Register and Address Descriptors*	*Source Language issues*
	SLO-2	*Minimization of DFA*	*Error Recovery in Predictive Parsing*	*Construction of Canonical LR(1) and LALR*	*Generating Code of Assignment Statements*	*Storage Organization*
S-13	SLO-1	*Minimization of NFA*	*Predictive Parsing Algorithm*	*Construction of LALR*	*Cross Compiler – T diagrams*	*Activation Records*
	SLO-2	*Design of lexical analysis (LEX)*	*Non Recursive Predictive Parser*	*Problems related to Canonical LR(1) and LALR Parsing Table*	*Issues in Cross compilers*	*Storage Allocation strategies*
S 14-15	SLO-1 SLO-2	*Lab 3 Conversion from NFA to DFA*	*Lab 6 Predictive Parsing Table*	*Lab9 Computation of LR(0) items*	*Lab 12 : A simple code Generator*	*Lab 15: Implement any one storage allocation strategies(heap, stack, static)*

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,NewYork,2013.*	*4. K.Muneeswaran,,"CompilerDesign",OxfordHigherEducation,Fourthedition2015* *5. DavidGalles,"ModernCompilerDesign",PearsonEducation,Reprint2012.* *6. RaghavanV.,"PrinciplesofCompilerDesign",TataMcGrawHillEducationPvt.Ltd.,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 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
		1. Ms.R.Jeya
		2. Mrs.J. Jeyasudha

Course Code	18CSC305J	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:
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 :	Understand the search technique procedures applied to real world problems
CLR-4 :	Understand 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:	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		LevelofThinking (Bloom)	ExpectedProficiency(%)	ExpectedAttainment(%)	EngineeringKnowledge	ProblemAnalysis	Design&Development	Analysis,Design, Research	ModernTool Usage	Society&Culture	Environment& Sustainability	Ethics	Individual & TeamWork	Communication	ProjectMgt.&Finance	LifeLongLearning	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 and apply learning 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 and implement natural language processing techniques	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 to AI-AI techniques	Searching techniques- Uniformed search-General search Algorithm	Knowledge and reasoning-Approaches and issues of knowledge reasoning	Planning- Planning problems, Simple planning agent	Expert system-Architecture
	SLO-2	Problem solving with AI	Uniformed search Methods-Breadth first search	Knowledge base agents-Logic Basics	Planning languages	Pros and Cons of expert system
S-2	SLO-1	AI Models, Data acquisition and learning aspects in AI	Uniformed search Methods-Depth first search	Logic-Propositional logic-syntax ,semantics and inferences	Blocks world ,Goal stack planning	Rule based systems
	SLO-2	Problem solving- Problem solving process, Formulating problems	Uniformed search Methods-Depth limited search	Propositional logic- Reasoning patterns	Mean Ends Analysis	Frame based expert system
S-3	SLO-1	Problem types and characteristics	Uniformed search Methods- Iterative Deepening search	Predicate logic – Syntax and semantics, instance and is relationship	Non-linear Planning	Case study
	SLO-2	Problem space and search	Bi-directional search	Unification and Resolution	Conditional planning, Reactive planning	Case study
S 4-5	SLO-1	Lab 1: Implementation of toy problems	Lab4: Implementation and Analysis of DFS and BFS for an application	Lab 7: Implementation of unification and resolution for real world problems.	Lab 10 :Implementation of block world problem	Natural language processing-Levels of NLP
	SLO-2					
S-6	SLO-1	Intelligent agent	Informed search- Generate and test, Best First search	Knowledge representation using rules	Learning- Machine learning	Syntactic and Semantic Analysis
	SLO-2	Rationality and Rational agent with performance measures	Informed search-A* Algorithm	Knowledge representation using semantic nets	Goals and Challenges of machine learning	Information retrieval
S-7	SLO-1	Flexibility and Intelligent agents	AO* research	Knowledge representation using frames	Learning concepts, models	Information Extraction

	SLO-2	*Task environment and its properties*	*Local search Algorithms-Hill Climbing, Simulated Annealing*	*Inferences*	*Artificial neural network based learning-Back propagation*	*Machine translation*
S-8	SLO-1	*Types of agents*	*Local Beam Search*	*Uncertain Knowledge and reasoning-Methods*	*Support vector machines*	*NLP Applications*
	SLO-2	*Other aspects of agents*	*Genetic Algorithms*	*Bayesian probability and belief network*	*Reinforcement learning*	*NLP Applications*
S 9-10	SLO-1 SLO-2	*Lab 2: Developing agent programs for real world problems*	*Lab 5: Developing Best first search and A* Algorithm for real world problems*	*Lab 8: Implementation of knowledge representation schemes - use cases*	*Lab 11: Implementation of learning algorithms for an application*	*Lab 14:Implementation of NLP programs*
S-11	SLO-1	*Constraint satisfaction problems(CSP)*	*Adversarial search Methods-Game playing-Important concepts*	*Probabilistic reasoning*	*Adaptive learning*	*Advance topics in Artificial Intelligence-Cloud Computing and intelligent agent*
	SLO-2	*Crypto arithmetic puzzles*	*Game playing and knowledge structure*	*Probabilistic reasoning over time*	*Multi_agent based learning*	*Business intelligence and analytics*
S-12	SLO-1	*CSP as a search problem-constrains and representation*	*Game as a search problem-Minimax approach*	*Forward and backward reasoning*	*Ensemble learning*	*Sentiment Analysis*
	SLO-2	*CSP-Backtracking, Role of heuristic*	*Minimax Algorithm*	*Other uncertain techniques-Data mining*	*Learning for decision making*	*Deep learning Algorithms*
S-13	SLO-1	*CSP-Forward checking and constraint propagation*	*Alpha beta pruning*	*Fuzzy logic*	*Distributed learning*	*Deep learning Algorithms*
	SLO-2	*CSP-Intelligent backtracking*	*Game theory problems*	*Dempster -shafer theory*	*Speedup learning*	*Planning and logic in intelligent agents*
S 14-15	SLO-1 SLO-2	*Lab 3: Implementation of constraint satisfaction problems*	*Lab 6: Implementation of minimax algorithm for an application*	*Lab 9: Implementation of uncertain methods for an application*	*Lab12: Development of ensemble model for an application*	*Lab 15: Applying deep learning methods to solve an application.*

Learning Resources

1. *Parag Kulkarni, Prachi Joshi, Artificial Intelligence –Building Intelligent Systems, 1st ed., PHI learning,2015*
2. *DeepakKemhani,FirstcourseinArtificialIntelligence,McGrawHillPvtLtd,2013*
3. *Stuart J. Russell, Peter Norwig , Artificial Intelligence –A Modern approach, 3rd Pearson Education, 2016*
4. *PrateekJoshi,ArtificialIntelligencewithPhython,1sted.,PacktPublishing,2017*
5. *DenisRothman,ArtificialIntelligencebyExample,Packt,2018*

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%*	*10%*	*10%*	*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%*	*20%*	*20%*	*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. Mr.Jagatheeswaran, Lead, Auxo labs jagatheeswarans.iot@auxolabs.in	*1. Dr. Chitrakala, Anna University, au.chitras@gmail.com*	*1. Dr.M.Pushpalatha, SRMIST*
2.	*2.*	*2. Dr.G..Vadivu, SRMIST*
	3.	*3. Dr.C.Lakshmi, SRMIST*

Course Code	18CSE391T	Course Name	BIG DATA TOOLS AND TECHNIQUES	Course Category	E	Professional Elective	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 :	Gain knowledge about the various tools and techniques used in big data analytics
CLR-2 :	Learn the fundamentals of Hadoop and the related technologies
CLR-3 :	Understand the basics of development of applications using MapReduce, HDFS, YARN
CLR-4 :	Learn the basics of Pig, Hive and Sqoop
CLR-5 :	Learn the basics of Apache Spark, Flink and understand the importance of NoSQL databases
CLR-6 :	Learn about Enterprise Data Science and data visualization tools

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning		
		1	2	3
		LevelofThinking (Bloom)	ExpectedProficiency (%)	ExpectedAttainment(%)
CLO-1 :	Use the various tools and techniques in big data analytics	2	80	85
CLO-2 :	Apply Hadoop and related technologies to big data analytics	2	75	80
CLO-3 :	Apply MapReduce, HDFS and YARN develop big data applications	2	85	80
CLO-4 :	Develop applications using Pig, Hive and Sqoop	2	80	75
CLO-5 :	Apply Apache Spark and Flink to applications and understand the importance of NoSQL databases	2	75	85
CLO-6 :	Understand the applications of Enterprise Data Science and data visualization tools	2	80	85

	Program Learning Outcomes (PLO)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	EngineeringKnowledge	ProblemAnalysis	Design& Development	Analysis,Design, Research	ModernTool Usage	Society&Culture	Environment& Sustainability	Ethics	Individual & TeamWork	Communication	ProjectMgt.&Finance	LifeLongLearning	PSO-1	PSO-2	PSO– 3
CLO-1 :	L	-	H	-	H	-	-	-	-	-	-	-	-	-	-
CLO-2 :	L	H	H	M	H	-	-	-	-	-	-	-	-	-	-
CLO-3 :	L	-	H	-	H	-	-	-	-	-	-	-	-	-	-
CLO-4 :	L	H	H	-	H	-	-	-	-	-	-	-	-	-	-
CLO-5 :	L	-	H	M	H	-	-	-	-	-	-	-	-	-	-
CLO-6 :	L	-	H	-	H	-	-	-	-	-	-	-	-	-	-

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Overview of Big Data Analytics	MapReduce	Setting up a Hadoop cluster	Introducing Oozie	Enterprise Data Science Overview
	SLO-2	Introduction to data analytics and big data	Analyzing data with Unix tools and Hadoop	Cluster specification and setup		
S-2	SLO-1	Big data mining	Scaling Out – Data Flow, Combiner Functions	Hadoop configuration	Apache Spark	Data Science Solutions in the enterprise
	SLO-2	Technical elements of the Big Data platform	Hadoop Streaming	YARN configuration		
S-3	SLO-1	Analytics Toolkit, Components of the analytics toolkit	HDFS	Introduction to Pig	Limitations of Hadoop and overcoming the limitations	Enterprise data science – Machine Learning and AI
	SLO-2	Distributed and Parallel Computing for Big Data		Installing and running pig	Core components and architecture of Spark	Enterprise Infrastructure solutions
S-4	SLO-1	Cloud computing and Big Data	Hadoop filesystems	Basics of Pig Latin	Introduction to Apache Flink	Visualizing Big Data
	SLO-2		Java Interface to Hadoop		Installing Flink	
S-5	SLO-1	In-Memory Computing Technology for Big Data	YARN	Introduction to Hive	Batch analytics using Flink	Using Python and R for visualization
	SLO-2		Job Scheduling	Installing and running Hive		Big Data Visualization Tools
S-6	SLO-1	Fundamentals of Hadoop	Hadoop I/O	Introduction to HiveQL	Big Data Mining with NoSQL	Data Visualization with Tableau
	SLO-2	Hadoop Ecosystem				
S-7	SLO-1	The core modules of Hadoop	Data Integrity	Introduction to Zookeeper	Why NoSQL?	Case Studies: Hadoop
	SLO-2		Compression	Installing and running Zookeeper	NoSQL databases	
S-8	SLO-1	Introduction to Hadoop MapReduce	Serialization	The Zookeeper Service	Introduction to HBase	Case Studies: Spark
	SLO-2		File based Data Structures	Flume Architecture		
S-9	SLO-1 SLO-2	Introduction to Hadoop YARN	Developing a MapReduce Application	Introduction to Sqoop	Introduction to MongoDB, Cassandra	Case Studies: NoSQL

Learning Resources	1. *TomWhite,Hadoop:The Definitive Guide,3rdEdition,O'Reilly,2012.* 2. *Sridhar Alla,Big Data Analytics with Hadoop3,Packt,2018.*	3. *NatarajDasgupta,Practical Big Data Analytics,Packt,2018.* 4. *DTEditorialServices,Big Data:Black Book,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 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

Course Code	18CSE355T	Course Name	DATA MINING AND ANALYTICS	Course Category	E	Professional Elective	L	T	P	C
							3	0	0	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	CSE	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 concepts of Data Mining	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-2 :	Familiarize with Association rule mining			
CLR-3 :	Familiarize with various Classification algortihms			
CLR-4 :	Understand the concepts of Cluster Analysis			
CLR-5 :	Familiarize with Outlier analysis techniques			
CLR-6 :	Familiarize with applications of Data mining in different domains			

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 :	Gain knowledge about the concepts of Data Mining	2	80	85
CLO-2 :	Understand and Apply Association rule mining techniques	2	75	80
CLO-3 :	Understand and Apply various Classification algortihms	2	85	80
CLO-4 :	Gain knowledge on the concepts of Cluster Analysis	2	80	75
CLO-5 :	Gain knowledge on Outlier analysis techniques	2	75	85
CLO-6 :	Understand the importance of applying Data mining concepts in different domains	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 :															
CLO-2 :															
CLO-3 :															
CLO-4 :															
CLO-5 :															
CLO-6 :															

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Why Data mining? What is Data mining ?	Mining frequent patterns: Basic concepts	Classification: Basic concepts	Cluster Analysis: Introduction	Outliers: Introduction
	SLO-2	Kinds of data meant for mining	Market Basket Analysis	General approach to Classification	Requirements and overview of different categories	Challenges of outlier detection
S-2	SLO-1	Kinds of patterns that can be mined	Frequent itemsets, Closed itemsets	Decision tree induction	Partitioning method: Introduction	Outlier detection methods: Introduction
	SLO-2	Applications suitable for data mining	Association rules-Introduction	Algorithm for Decision tree induction	k-means	Supervized and Semi-supervized methods
S-3	SLO-1	Issues in Data mining	Apriori algorithm-theoritical approach	Numerical example for Decision tree induction	k-medoids	Unsupervized methods
	SLO-2	Data objects and Attribute types	Apply Apriori algorithm on dataset-1	Attribute selection measure	Hierarchical method: Introduction	
S-4	SLO-1	Statistical descriptions of data	Apply Apriori algorithm on dataset-2	Tree pruning	Agglomerative vs. Divisive method	Statistical and Proximity based methods
	SLO-2		Generating Association rules from frequent itemsets	Scalability and Decision tree induction	Distance measures in algorithmic methods	
S-5	SLO-1	Need for data preprocessing and data quality	Improving efficiency of Apriori	Bayes' Theorem	BIRCH technique	Statistical approaches
	SLO-2			Naïve Bayesian Classification		
S-6	SLO-1	Data cleaning	Pattern growth approach	IF-THEN rules for classification	DBSCAN technique	Statistical data mining
	SLO-2	Data integration		Rule extraction from a decision tree		
S-7	SLO-1	Data reduction	Mining frequest itemsets using Vertical data format	Metrics for evaluating classifier performance	STING technique	Data mining and recommender systems
	SLO-2		Strong rules vs. weak rules	Cross validation		
S-8	SLO-1	Data transformation	Association analysis to Correlation analysis	Bootstrap	CLIQUE technique	Data mining for financial data analysis
	SLO-2			Ensemble methods-Introduction		
S-9	SLO-1	Data cube and its usage	Comparison of pattern evaluation measures	Bagging and Boosting	Evaluation of clustering techniques	Data mining for Intrusion detection

	SLO-2		***Random Forests: Introduction***		

Learning Resources	1. *Jiawei Han and Micheline Kamber, " Data Mining: Concepts and Techniques", 3rd Edition, Morgan Kauffman Publishers, 2011.* 2.	3. 4.

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
1. Mr.V.Selvakumar, Hexaware Technologies, selvakumarv@hexaware.com	***1. Dr.Latha Parthiba, Pondicherry University, lathaparthiban@yahoo.com***	***1. Mr.L.N.B.Srinivas, SRMIST***
2.	2.	***2. Mr.S.Karthick, SRMIST*** ***3. Dr.V.V.Ramalingam, SRMIST***

Course Code	18CSE392T	Course Name	MACHINE LEARNING - I	Course Category	E	Professional Elective	L	T	P	C
							3	0	0	3

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning
CLR-1 :	To provide basic concepts of machine learning	
CLR-2 :	To provide deeper understanding of various tools and techniques for Machine learning Algorithms and outputs	
CLR-3 :	Understand and Implement the major classification techniques	
CLR-4 :	Understand and Implement the various Clustering Methods	
CLR-5 :	Learn and Understand the Tree based machine Learning Algorithms	

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 :	Understand the concepts of machine learning	2	80	85
CLO-2 :	Learn and understand machine tools and libraries of machine learning	2	75	80
CLO-3 :	Learn and understand the linear learning models and classification in machine learning	2	85	80
CLO-4 :	Understand the clustering techniques and their utilization in machine learning	2	80	75
CLO-5 :	Study the tree based machine learning techniques and to appreciate their capability	2	75	85

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 :	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-2 :	H	H	H	-	H	-	-	-	-	-	-	-	-	-	-
CLO-3 :	H	H	-	-	H	-	-	-	-	-	-	-	-	-	-
CLO-4 :	H	H	-	-	H	-	-	-	-	-	-	-	-	-	-
CLO-5 :	H	H	-	H	H	-	-	-	-	-	-	-	-	-	-

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Machine Learning: What and Why?	Platform for machine learning	Ridge Regression	Measuring (dis)similarity	Decision tree representation
	SLO-2	Types of Machine Learning	Machine learning python libraries		Evaluating output of clustering methods	
S-2	SLO-1	Supervised Learning	Scikit-learn	Maximum likeliwood estimation (least squares)	Spectral clustering	Basic decision tree learning algorithm
	SLO-2	Unsupervised Learning	training data – testing data – validation data		Hierarchical clustering	
S-3	SLO-1	Reinforcement learning	k-fold cross validation	principal component analysis	Agglomerative clustering	Inductive bias in decision tree
	SLO-2	The Curse of dimensionality	Features		Divisive clustering	
	SLO-1	Over fitting and under fitting	Performance metrics		Choosing the number of clusters	
S-4	SLO-2	linear regression	MSE, accuracy, confusion matrix, precision	Bayesian classifier	Clustering datapoints and features	Decision tree construction
S-5	SLO-1	Bias and Variance tradeoff	recall, F- score	Support vector machine	Bi-clustering	Issues in decision tree
	SLO-2	Testing – cross validation				
S-6	SLO-1	Regularization	Linear Regression with multiple variables	Support vector machine + kernels	Multi-view clustering	Classification and regression trees (CART)
	SLO-2	Learning Curve				
S-7	SLO-1	Classification	Logistic Regression	Multi class classification	K-Means clustering	Random Forest
	SLO-2	Error and noise				Random Forest with scikit-learn
S-8	SLO-1	Parametric vs. non-parametric models	spam filtering with logistic regression	K nearest neighbour classification	K-meloids clustering	Multivariate adaptive regression trees (MART)
	SLO-2					Introduction to Artificial Neural Networks
S-9	SLO-1	Linear Algebra for machine learning	Naive Bayes with scikit-learn	Application: face recognition with PCA	Application: image segmentation using K-means clustering	Perceptron learning
	SLO-2					

Learning Resources

1. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012.
2. Ethem Alpaydin, "Introduction to Machine Learning", Prentice Hall of India, 2005
3. Tom Mitchell, "Machine Learning", McGraw-Hill, 1997.
4. Sebastian Raschka, Vahid Mirjilili,"Python Machine Learning and deep learning", 2nd edition, kindle book, 2018
5. Carol Quadros,"Machine Learning with python, scikit-learn and Tensorflow", Packet Publishing, 2018.

		6. *Gavin Hackeling," Machine Learning with scikit-learn", Packet publishing, O'Reily, 2018.*

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
		Dr.G.Vadivu
		Dr. UshaKiruthika
		Mr.S.Joseph James

Course Code	18CSE360T	Course Name	INFORMATION STORAGE AND MANAGEMENT	Course Category	E	Professional Elective	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 :	Understand the components of storage infrastructure.
CLR-2 :	Gain knowledge to evaluate storage architectures including storagesubsystems
CLR-3 :	Understand the business continuity, backup and recovery methods.
CLR-4 :	Acquire knowledge on information security framework
CLR-5 :	Introduce the working principle of storage infrastructure with monitoring principles
CLR-6 :	Understand the structure of cloud computing and its techniques

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 :	Acquire the knowledge on the components of storage infrastructure	3	80	70	M	-	-	-	-	-	-	-	L	-	-	M	-	-	-
CLO-2 :	Acquire the ability to evaluate storage architectures including storagesubsystems	3	85	75	M	M	M	M	-	-	-	-	L	-	-	H	-	-	-
CLO-3 :	Understand the business continuity, backup and recovery methods.	3	75	70	M	M	M	M	-	-	-	-	L	-	-	H	-	-	-
CLO-4 :	Appreciate the concepts of storage security and information security applied to virtual machine	3	85	80	M	M	L	L	-	-	-	-	M	-	-	H	-	-	-
CLO-5 :	Apply the knowledge for storage infrastructure	3	85	75	L	M	-	-	-	-	-	-	M	-	-	H	-	-	-
CLO-6 :	Acquire the knowledge on structure of cloud computing and its techniques	3	80	70	M	-	-	-	-	-	-	-	L	-	-	H	-	-	-

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Introduction to Information Storage Management	Virtualization and Cloud Computing : Fiber Channel: Overview	Business Continuity And Back Up Recovery :Business Continuity: Information Availability .	Storage Security And Management :	Cloud Computing: Cloud Enabling Technologies
	SLO-2	Evolution of Storage Architecture	SAN and its Evolution	BC Terminology, BC Planning life cycle	Information Security Framework	Characteristics of Cloud Computing
S-2	SLO-1	Data Centre Infrastructure	Components of FC SAN, FCConnectivity, FC Architecture	Failure Analysis, Business Impact Analysis	Risk Triad	Benefits of Cloud Computing
	SLO-2	Virtualization and Cloud Computing	IPSAN-iSCSI components	BC Technology Solutions	Storage Security Domains	Cloud Service Models
S-3	SLO-1	Key challenges in managing information.	iSCSI Protocol StackiSCSI Names	Backup and Archive: Backup Purpose	Security Implementations in Storage Networking	Cloud Deployment models
	SLO-2	Data Center Environment: Application	NAS: General Purpose Servers versus NAS Devices	Backup Considerations	Securing Storage Infrastructure in Virtualized and Cloud Environments	Cloud Infrastructure Mechanism: Logical Network Perimeter
S 4-5	SLO-1	Database Management System (DBMS)	Benefits of NAS- File Systems and Network File Sharing	Backup Granularity , Recovery considerations	RSA and VMware Security Products	Virtual Server , Cloud Storage Device
	SLO-2					
S-6	SLO-1	Host : Connectivity, Storage	Components of NAS	Backup Methods, Backup Architecture	Monitoring the Storage Infrastructure	Cloud Usage Monitor
	SLO-2	Disk Drive Components,Disk Drive Performance	NAS I/O Operation	Backup and Restore Operations	Monitoring Parameters,	Resource Replication
S-7	SLO-1	Intelligent Storage System	NAS Implementations	Backup Topologies	Components Monitored, Monitoring examples	Ready Made environment
	SLO-2	Components of an Intelligent Storage System	NAS File Sharing Protocols	Backup in NAS Environments	Storage Infrastructure Management Activities	Container
S-8	SLO-1	Storage Provisioning	Object Based Storage Devices	Backup Targets, Data Deduplication for Backup	Storage Infrastructure Management Challenges, Storage Management Examples	Cloud Challenges
	SLO-2	Types of Intelligent Storage Systems	Content Addressed Storage	Backup in Virtualized Environments	Storage Allocation to a New Server/Host,	Cloud Adoption Considerations

S-9	SLO-1 SLO-2	*Creation of Virtual storage machine , Navigation of storage system .*	*Configuration and Tracing of FC scan and iSCSI scan*	*Sharing Files between host and Virtual Machines, Usage of Backup techniques*	*Creation of an Linux Instance in Public Cloud, Generate a private key, Access using SSH client*	*Usage of Cloud services with open source cloud tools (like Eucalyptus, Openstack, Open Nebula and others)*

Learning Resources	*1. EMC Corporation, "Information Storage and Management",2nd edition Wiley India, ISBN13: 978-1118094839* *2. Thomas Erl, "Cloud Computing: Concepts, Technology & Architecture", Prentice Hall ,2013,ISBN: 9780133387568*	*3. UifTroppen Rainer Wolfgang Muller,"Storage Networks Explained", India, Wiley, 2010, ISBN13: 978-0470741436*

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
	Dr.V.Masillamani	*1. Dr.B.Amutha SRMIST*
		2. Dr.A.Shanthini, SRMIST

Course Code	18CSE393T	Course Name	TEXT MINING	Course Category		*Professional Elective*	L	T	P	C
							3	0	0	3

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

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*
CLR-1 :	*Understand the fundamentals of text mining*
CLR-2 :	*Utilize text for prediction techniques*
CLR-3 :	*Understand the relevance between information retrieval and text mining*
CLR-4 :	*Understand the goals of information extraction*
CLR-5 :	*Analyze different case studies related to text mining*

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 knowledge on fundamentals of text mining*	*2*	*80*	*85*	*H*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-2 :	*Perform prediction from text and evaluate it*	*2*	*80*	*80*	*H*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-3 :	*Perform document matching*	*2*	*80*	*75*	*H*	*M*	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-4 :	*Identify patterns and entities from text*	*2*	*75*	*85*	*H*	-	*M*	-	*M*	-	-	-	-	-	-	-	-	-	-
CLO-5 :	*Understand how text mining is implemented*	*2*	*80*	*85*	*H*	-	-	-	-	-	-	-	-	-	*L*	-	-	-	-

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Overview of text mining	Labels for the Right Answers	Linear scoring Methods	Clustering Documents by similarity	Ideal Model of Data
	SLO-2	Special about Text Mining	Feature selection by attribute ranking	Evaluation of Performance	Similarity of composite documents	Practical Data Sourcing
S-2	SLO-1	Structured Data	Sentence Boundary Determination	Estimating current and future performance	K-means Clustering	Prototypical Examples
	SLO-2	Unstructured Data	Part of speech Tagging	Getting the most from a Learning Method	Hierarchical Clustering	Hybrid Example
S-3	SLO-1	Is text different from numbers	Word Sense Disambiguation	Errors and Pitfalls in Big data Evaluation	The EM Algorithm	Mixed Data in Standard Table Format
	SLO-2	Types of Problem can be solved.	Phrase Recognition	Graph models for social Networks	Goals for Information Extraction	Case study: Market Intelligence from the web
S-4	SLO-1	Document Classification	Named Entity Recognition	Information Retrieval and Text Mining	Finding Patterns and Entities from Test	Case Study: Lightweight Document Matching for Digital Libraries
	SLO-2	Informational Retrieval	Parsing	Keyword search	Entity Extraction as Sequential Tagging	Generating Model cases for Help desk Application: case study
S-5	SLO-1	Prediction and Evaluation	Feature Generation	Nearest- Neighbor Methods	Tag Prediction as Classification	Assigning topics to news articles: Case study
	SLO-2	From Textual Information to Numerical Vectors	Using text for prediction	Measuring Similarity	The maximum Entropy method	E-mail Filtering: Case study
S-6	SLO-1	Collecting Documents	Recognizing that document Fit a pattern	Shared Word Count	Linguistic Features and Encoding	SearchEngines : case study
	SLO-2	Document Standardization	Document Classification	Word count and Bonus	Local Sequence Prediction Models	Extracting Named Entities from Documents
S-7	SLO-1	Tokenization	Learning to Predict from Text	Cosine Similarity	Global sequence Prediction Models	Mining Social Media
	SLO-2	Lemmatization	Similarity and Nearest-Neighbor Method	Web based Document Search	Coreference and relationship Extraction	Customized Newspapers
S-8	SLO-1	Inflectional Stemming	Document Similarity	Link Analysis	Template Filling And Database Construction	Emerging Directions
	SLO-2	Stemming to a Root	Decision Rules	Document Matching	Commercial Extraction System: Application	Different ways of collecting samples
S-9	SLO-1	Vector Generation for Prediction	Decision trees	Inverted List	Criminal Justice : Application	Learning to Unlabeled data
	SLO-2	Multiword Features	Scoring by Probabilities	Evaluation of Performance	Intelligence Applicaton	Distributed Text Mining

Learning Resources	*1.* By Sholom M. Weiss, Nitin Indurkhya, Tong Zhang.,*Fundamentals of Predictive Text Mining*	*2.*

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
		Dr.E.Poovammal, SRMIST
		Mr.L.N.B.Srinivas, SRMIST
		Mr.D.Vivek, SRMIST

Course Code	18CSE394T	Course Name	BUSINESS INTELLIGENCE AND ANALYTICS	Course Category	E	Professional Elective	L	T	P	C
							3	0	0	3

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
CLR-1 :	Familiarize with Business Intelligence, Analytics and Decision Support	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-2 :	Understand the technologies for Decision making			
CLR-3 :	Familiarize with predictive modeling techniques			
CLR-4 :	Familiarize with sentiment analysis techniques			
CLR-5 :	Understand about Multi-criterai Decision making systems			
CLR-6 :	Familiarize with Automated decision systems			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning		
		1	2	3
CLO-1 :	Gain knowledge on Business Intelligence, Analytics and Decision Support	2	80	85
CLO-2 :	Understand the technologies for Decision making	2	75	80
CLO-3 :	Apply predictive modeling techniques	2	85	80
CLO-4 :	Apply sentiment analysis techniques	2	80	75
CLO-5 :	Gain knowledge on Multi-criterai Decision making systems	2	75	85
CLO-6 :	Gain knowledge on Automated decision systems	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 :															
CLO-2 :															
CLO-3 :															
CLO-4 :															
CLO-5 :															
CLO-6 :															

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Information Systems Support for Decision Making	Decision Making:	Basic Concepts of Neural Networks	Decision Support Systems modeling	Automated Decision Systems
	SLO-2		Introduction and Definitions	Developing Neural Network	Structure of mathematical models for decision support	The Artificial Intelligence field
S-2	SLO-1	An Early Framework for Computerized Decision Support	Phases of the Decision	Based Systems	Decision making under certainty	Basic concepts of Expert Sysytems
	SLO-2		Making Process	Illuminating the Black Box of ANN with Sensitivity	Uncertainty and Risk	
S-3	SLO-1	The Concept of Decision Support Systems	The Intelligence Phase	Support Vector Machines	Decision modeling with spreadsheets	Applications of Expert Sysytems
	SLO-2			A Process		
S-4	SLO-1	A Framework for Business Intelligence	Design Phase	Based Approach to the Use of SVM	Mathematical programming optimization	Structure of Expert Sysytems
	SLO-2			Nearest Neighbor Method for Prediction		
S-5	SLO-1	Business Analytics Overview	Choice Phase	Sentiment Analysis Overview	Decision analysis-introduction	Knowledge Engineering
	SLO-2					
S-6	SLO-1	Brief Introduction to Big Data Analytics	Implementation Phase	Sentiment Analysis Applications	Decision tables	Development of Expert Sysytems
	SLO-2					
S-7	SLO-1	Clickstream Analysis	Decision Support SystemsCapabilities	Sentiment Analysis Process	Decision Trees	Location based Analytics
	SLO-2	Metrics				
S-8	SLO-1	Clickstream Analysis	Decision Support SystemsClassification	Sentiment Analysis	Multi-criteria decision making	Cloud Computing
	SLO-2	Practical Solutions				
S-9	SLO-1	Competitive Intelligence Analysis	Decision Support SystemsComponents	Speech Analytics	Pairwise comparisons	Business Intelligence
	SLO-2					

Learning Resources	1. *Ramesh Sharda, Dursun Delen, EfraimTurban, J.E.Aronson,Ting-Peng Liang, David King, "Business Intelligence and Analytics: System for Decision Support", 10th Edition, Pearson Global Edition, 2013.* 2.	3. 4.

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
1. Mr.V.Selvakumar,Hexaware Technologies, selvakumarv@hexaware.com	*1.*	*1. Mr.L.N.B.Srinivas, SRMIST*
2.	2.	*2. Ms.S.Nagadevi, SRMIST*

Course Code	18CSE395T	Course Name	WEB INTELLIGENCE	Course Category	E	Professional Elective	L	T	P	C
							3	0	0	3

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	Understand the topics of Web Intelligence
CLR-2 :	Study models of information retrieval, semantic webs, search engines, and web mining.
CLR-3 :	Gain knowledge on the algorithmic aspect of Web Intelligent systems
CLR-4 :	Acquire knowledge on Data mining techniques
CLR-5 :	Understand the impact of Social Network Design for Web Intelligence
CLR-6 :	Gain Knowledge on different approaches required for studying the impact of social network for Web Intelligence

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
		LevelofThinking (Bloom)	ExpectedProficiency (%)	ExpectedAttainment(%)	EngineeringKnowledge	ProblemAnalysis	Design&Development	Analysis,Design, Research	ModernTool Usage	Society&Culture	Environment& Sustainability	Ethics	Individual & TeamWork	Communication	ProjectMgt.&Finance	LifeLongLearning	PSO-1	PSO-2	PSO–3
CLO-1 :	Acquire the knowledge on topics and benefits of Web Intelligence	2	80	85	H	-	-	-	-	-	-	-	-	-	-	H	H	H	-
CLO-2 :	Acquire the ability to build models of information retrieval, semantic webs, search engines, and web mining.	2	75	80	H	H	H	-	H	-	-	-	-	-	-	H	H	H	M
CLO-3 :	Understand the basic ideas of Multimedia Information Retrieval	2	85	80	H	-	-	-	-	H	-	-	-	-	-	H	H	H	H
CLO-4 :	Acquire knowledge to use web crawlers and fetch relevant information	2	80	75	H	H	H	M	M	-	-	-	-	-	-	H	H	H	H
CLO-5 :	Acquire knowledge to refine the social network design approached used for developing intelligent web	2	75	85	H	-	-	H	H	-	-	-	-	-	-	H	H	H	H
CLO-6 :	Apply the knowledge of different web intelligence based algorithms in practical applications	2	80	85	H	-	H	-	-	H	-	-	-	-	-	H	H	H	H

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Introduction to Web Intelligence	Information Retrieval-	Data Mining Techniques-Classification	Web Content Mining-Web Crawlers	Social Network Design for Web Intelligence:
	SLO-2	What is Web Intelligence? Benefits of Intelligent Web:What applications can benefit from web intelligence	Introduction, Document Representation			Introduction: Social Network Design for Web Intelligence
S-2	SLO-1	Wisdom Web	Retrieval Models	Data Mining Techniques-Clustering and Association	Web Crawlers	Overview of Social Intelligence Design: Groups and Communities, Issues of Social Intelligence Design, Applications of Social Intelligence Design
	SLO-2					
S-3	SLO-1	Ingredients of Intelligent Web	Retrieval Models	Data Mining Techniques- Association	Search Engines	The Travelling Conversation Model
	SLO-2					
S-4	SLO-1	Topics of Web Intelligence	Evaluation of Retrieval Performance	Web Usage Mining- Web-Log processing	Personalization of Web Content	A Broadcast-Based Approach
	SLO-2					
S-5	SLO-1	How can I build intelligence in my own application?	Semantic Web-Introduction, The Layered-Language Model	Web Usage Mining -Analyzing Web Logs	Multimedia Information Retrieval	A Conversational Agent-Based Approach
	SLO-2					
S-6	SLO-1	Examples of intelligent web applications	Metadata and Ontologies	Applications of Web Usage Mining Clustering of Web Users	Web Structure Mining- Modeling Web Topology	Smart Environment based approach
	SLO-2					
S-7	SLO-1	Fallacies of Intelligent applications	Ontology Languages for the Web	Applications of Web Usage Mining-Classification Modeling of Web Users	PageRank Algorithm	Psychological Evaluation, Technical Issues
	SLO-2					
S-8	SLO-1	Related Technologies	Tool Environment for the Ontology RDFferret-Full Text Search and RDF Querying. OntoShare-Community support Onto Edit-Ontology Development	Applications of Web Usage Mining-Association Mining of Web Usages	Hyperlink-Induced Topic Search (HITS)	Case Study-Putting it all together : an intelligent news portal
	SLO-2					

S-9	SLO-1	*Related Technologies*	*OntoView-Change Management for Ontologies* *Sesame-Repositories for Ontologies and Data*	*Sequence-Pattern Analysis of Web Logs*	*Random Walks on the Web*	*Case Study-Applying Web Intelligence for Business Intelligence*
	SLO-2		*CORPORIUM-Information Extraction*			

Learning Resources	*1.Akerkar, R. & Lingras, P. (2008). Building an Intelligent Web: Theory and practice. Jones and Bartlett Publishers, Sudbury, Massachusetts. ISBN-13: 978-0-7637-4137-2* *2. Marmanis & Babenko: Algorithms of the Intelligent Web, Manning Publications, 2009, ISBN:978-1933988665*	*3. Witten, Ian H. & Frank, E. (2005). Data Mining: Practical Machine Learning Tools and Techniques. 2nd Edition, Morgan Kaufman. ISBN 0120884070, 9780120884070* *4. Bing Liu: Web Data Mining, Springer, 2nd ed. 2011 (view online or download fromSpringerlink)* *5. Manning, Raghavan and Schuetze: Introduction to Information Retrieval, CambridgeUniversityPress,2008(bookavailableonline)* *6. N. Zhong, J.M. Liu, Y.Y. Yao,* Web Intelligence *(Springer, 2003)*

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
1. Dr.B.Sathiya, Data Scientist,SPi Global - Analytics & AI,Adyar, Chennai	*1. Dr.S.RenugaDevi, Assistant Professor(Sl.Gr.),College of Engineering,Guindy,AnnaUniversity,Chennai*	*1. Dr.G.Manju*
		2.Mr.K.Vijayakumar
		3.Mr.LNB.Srinivas

Course Code	18CSE396T	Course Name	DATA SCIENCE	Course Category	E	Professional Elective	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 :	Able to apply fundamental algorithmic ideas to process data
CLR-2 :	Understand the Data Analytics lifecycle
CLR-3 :	Able to construct predictive models to classify new data set
CLR-4 :	Learn to apply hypotheses and data into actionable predictions
CLR-5 :	Document and communicate the results effectively to different stakeholders
CLR-6 :	Effectively communicate the findings using visualization techniques

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
		LevelofThinking (Bloom)	ExpectedProficiency (%)	ExpectedAttainment(%)	EngineeringKnowledge	ProblemAnalysis	Design&Development	Analysis,Design,	ModernTool Usage	Society &Culture	Environment& Sustainability	Ethics	Individual & TeamWork	Communication	ProjectMgt.&Finance	LifeLongLearning	PSO-1	PSO-2	PSO– 3
CLO-1 :	Able to comprehend basic methods of processing data from real world problems	2	85	80	L	M	L	L	H	L	L	L	L	L	M	M	H	M	L
CLO-2 :	Able to convert data into actionable insights	2	80	75	M	H	L	M	M	L	L	M	M	M	M	H	M	M	M
CLO-3 :	Build clustering and classification models using R environment	3	85	80	H	M	H	H	H	L	L	M	H	M	H	M	M	H	M
CLO-4 :	Apply statistical techniques for evaluation	3	75	70	M	H	H	H	H	L	M	M	H	H	H	H	M	H	H
CLO-5 :	Analyze and validate the models using appropriate performance metrics	4	80	75	H	H	M	H	M	L	M	M	H	M	H	H	M	H	H
CLO-6 :	Present the results using effective visualization techniques	4	85	80	M	M	M	H	H	M	L	H	H	H	H	H	M	M	H

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Data science process	Approaching Analytics Problems	Introduction to R	Choosing and evaluating models	Documentation
	SLO-2	The roles in a data science project	Key roles for successful Analytics project	R Graphical user interfaces	Schematic model construction and evaluation	Knitr package
S-2	SLO-1	Stages in data science project	Discovery	Data Import and Export	Mapping problems to machine learning	Deploying models
	SLO-2	Define, Collect, Build, Evaluate, Present and Deploy	Business domain, Resources, Problem framing, Key stakeholders, Analytics sponsors, Initial hypotheses, Data sources	Attributes and Data Types	Solving classification problems, working without known targets	Deploying R HTTP services and exporting
S-3	SLO-1	Working with data from files	Data Preparation	Vectors	Evaluating classification models	Presenting your results to the project sponsor
	SLO-2	Structured data, other data formats and Transforming data in R	Learning about the data, conditioning	Arrays and Matrices	Accuracy, precision, Recall, sensitivity and specificity	Summarizing the project goals and stating the results
S-4	SLO-1	Working with relational databases and NoSQL databases	Model Planning	Data Frames	Evaluating clustering models	Presenting your model to end user
	SLO-2	Staging and Curating the data	Data exploration, Model selection	Lists	Intracluster distance, cross cluster distance	Presenting your work to other data scientist
S-5	SLO-1	Exploring data	Model Building	Factors	Validating models	Introduction to data analysis
	SLO-2	Using summary statistics to spot problems	Common tools for model building	Contingency Tables	Overfitting, Quantifying model soundness, Ensuring model quality	Visualization before Analysis
S-6	SLO-1	Managing data	Communicate Results	Descriptive statistics	Memorization methods	Dirty data
	SLO-2	Cleaning data	Analysis over the different models	Model building, Evaluation and Deployment	Using single variable and multi variable	Visualizing a single variable
S-7	SLO-1	Sampling for modeling and validation	Operationalize	Hypotheses Testing	Linear regression	Examining multiple variables

	SLO-2	*Training and test set split, Sample group column, Record grouping, Data provenance*	*Moving the model to deployment environment*	*Null hypotheses and Alternative hypotheses*	*Building a linear regression model and predicting*	*Dotchart and Barplot*
S-8	SLO-1	*Data Structures*	*Analytics Plan*	*Difference of means*	*Logistic regression*	*Box and Whisker plot*
	SLO-2	*Structured, Semi-structured, Quasi-structured and Unstructured data*		*Student t-test, Welch's t-test*	*Building a logistic regression model and predicting*	*Hexbinplot for large datasets*
S-9	SLO-1	*Drivers of big data*	*Key deliverables of analytics project*	*Wilcoxon Rank-Sum test*	*Unsupervised methods*	*Scatterplot matrix*
	SLO-2	*Devices – Mobile, smart devices*	*Presentation: Project sponsors, Analysts, Code, Technical specifications*	*Type I and II errors*	*Cluster analysis*	*Analyzing a variable over time*

Learning Resources	1. *David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big Data Analytics" , EMC Education Services,2015* 2. *NinaZumel,JohnMount,"PracticalDataSciencewithR",ManningPublications,2014* 3. *JureLeskovec,AnandRajaraman,JeffreyD.Ullman,"MiningofMassiveDatasets",Cambridge University Press,2014*	4. *MarkGardener,"BeginningR-TheStatisticalProgrammingLanguage",JohnWiley&Sons,Inc,2012* 5. W.N.Venables,D.M.SmithandtheRCoreTeam,"AnIntroductiontoR",2013 6. *Tony Ojeda, Sean Patrick Murphy, Benjamin Bengfort, Abhijit Dasgupta, "Practical Data Science Cookbook", Packt Publishing Ltd.,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	*40 %*	-	*30 %*	-	*30 %*	-	*30 %*	-	*30%*	-
	Understand										
Level 2	Apply	*30 %*	-	*40 %*	-	*30 %*	-	*40 %*	-	*40%*	-
	Analyze										
Level 3	Evaluate	*30 %*	-	*30 %*	-	*40 %*	-	*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
1. Dr. Pethuru Raj, Reliance Jio Infocomm Ltd, *peterindia@gmail.com*	***1.*** *Prof. P.Marikkannu, IT HOD, Anna University Regional centre, Coimbatore****,*** *pmarikkannu@gmail.com*	*1. Dr. G. Vadivu, SRMIST*
	2. Prof. E.Ilavarasan, Pondicherry University, eilavarasan@pec.edu	*2. Dr.B.Baranidharan, SRMIST*
		3. Mr.D.Vivek, SRMIST

Course Code	18CSE455T	Course Name	DATABASE SECURITY AND PRIVACY	Course Category	E	Professional Elective	L	T	P	C
							3	0	0	3

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	Understand the fundamentals of security relates to information
CLR-2 :	how security is maintained in information systems
CLR-3 :	Understand the concept of security models in database
CLR-4 :	Implementation of virtual private database
CLR-5 :	Learn the procedures of database auditing
CLR-6 :	Implementation of data mining algorithms for PPDM

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
		LevelofThinking (Bloom)	ExpectedProficiency (%)	ExpectedAttainment(%)	EngineeringKnowledge	ProblemAnalysis	Design&Development	Analysis,Design, Research	ModernTool Usage	Society&Culture	Environment& Sustainability	Ethics	Individual & TeamWork	Communication	ProjectMgt.&Finance	LifeLongLearning	PSO-1	PSO-2	PSO– 3
CLO-1 :	Acquire the knowledge of information system and information security	2	80	85	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-2 :	Able to manage the security of information system as well as database	2	75	80	H	H	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-3 :	Able to design and develop the security model in database	2	85	80	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-4 :	Able to implement VPD in various database	2	80	75	H	H	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-5 :	Able to audit the database activities, users, security	2	75	85	H	-	-	H	-	-	-	-	-	-	-	-	-	-	-
CLO-6 :	Apply the security mechanism in PPDM using various algorithms	2	80	85	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Security Architecture: Introduction	Administration of Users-Introduction	Database Application Security Models: Introduction-	Auditing Database Activities-introduction	Privacy Preserving Data Mining Techniques: Introduction
	SLO-2	Information Systems	Authentication	Types of Users	Oracle Database Activities	Data Mining Techniques:
S-2	SLO-1	Database Management Systems	Creating Users	-Security Models	Oracle Database Activities	Privacy Preserving Data Mining Algorithms
	SLO-2	Information Security Architecture	SQL Server User	Application Types	Creating DLL Triggers with Oracle	Privacy Preserving Data Mining Algorithms
S-3	SLO-1	- Database Security	Removing, Modifying Users	-Application Security Models	Creating DLL Triggers with Oracle	General Survey-Data Mining Techniques
	SLO-2	Asset Types and value	Default users	Data Encryption	Auditing Database Activities with Oracle	Randomization Methods
S-4	SLO-1	Security Methods	Remote Users	Virtual Private Databases: Introduction	Auditing Database Activities with Oracle	Randomization Methods
	SLO-2	Operating System Security Fundamentals: Introduction	Database Links	-Overview of VPD	Auditing Server Activity with SQL Server 2000	Group Based Anonymization
S-5	SLO-1	Operating System Overview	Linked Servers	Implementation of VPD using Views	Auditing Server Activity with SQL Server 2000	Group Based Anonymization
	SLO-2	Security Environment	Remote Servers	Application Context in Oracle	Auditing Server Activity with SQL Server 2000	Distributed Privacy Preserving Data Mining
S-6	SLO-1	Security Components	Practices for Administrators and Managers-	Implementing Oracle VPD-	Auditing Server Activity with Oracle	Distributed Privacy Preserving Data Mining
	SLO-2	Authentication Methods	Profiles, Password Policies, Privileges and Roles: Introduction	Implementing Oracle VPD	Auditing Server Activity with Oracle	Curse of Dimensionality
S-7	SLO-1	User Administration	Defining and Using Profiles	Viewing VPD Policies	Security and Auditing	Application of Privacy Preserving Data Mining
	SLO-2	Password Policies	Designing and Implementing Password Policies	VPD using views	Security and Auditing	Application of Privacy Preserving Data Mining
S-8	SLO-1	Vulnerabilities	Best Practices	Application contexts using Data Dictionary	Casestudy: projest security and auditing	Casestudy: on PPDM
	SLO-2	Vulnerabilities	Granting and Revoking User Privileges	Policy manager implementation	Casestudy: projest security and auditing	Casestudy: on PPDM

S-9	SLO-1	*Email Security*	*Creating, Assigning and Revoking User Roles*	*Policy Manager Implementing Row and Column level Security with SQL Server*	*Casestudy: projest security and auditing*	*Casestudy: on PPDM*
	SLO-2	*Internet security*	*Best practices*	*Policy Manager Implementing Row and Column level Security with SQL Server*	*Casestudy: projest security and auditing*	*Casestudy: on PPDM*

Learning Resources	*1.HassanA.Afyouni,"DatabaseSecurityandAuditing",ThirdEdition,CengageLearning,2009.* *2. RonBenNatan,"ImplementingDatabaseSecurityandAuditing",ElsevierDigitalPress,2005*	*1. Charu C. Aggarwal, Philip S Yu, "Privacy Preserving Data Mining": Models and Algorithms, Kluwer Academic Publishers, 2008*

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
1. Mr.SomuChockalingam, Founder and President,Doyensys,Chennai	*Dr.K.Vivekanandan,Professor,Pondicherry Engineering College*	*1. Dr.B.Murugananthan,SRMIST*
		2.. Ms.Thenmozhi,SRMIST
		3.. M.Maheswari,SRMIST

Course Code	18CSE487T	Course Name	DATA WAREHOUSING AND ITS APPLICATIONS	Course Category	E	Professional Elective	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 :	Understand the basic idea of data warehouse
CLR-2 :	To learn step by step approach to design a data warehouse
CLR-3 :	Understand ETL Process
CLR-4 :	To learn building process of data warehouse and implementation of data mart
CLR-5 :	Identify the Data mining concepts with various domains
CLR-6 :	To learn case studies to bring out practical aspects of data warehouse

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
		LevelofThinking (Bloom)	ExpectedProficiency (%)	ExpectedAttainment(%)	EngineeringKnowledge	ProblemAnalysis	Design&Development	Analysis,Design, Research	ModernTool Usage	Society&Culture	Environment& Sustainability	Ethics	Individual & TeamWork	Communication	ProjectMgt.&Finance	LifeLongLearning	PSO-1	PSO-2	PSO– 3
CLO-1 :	Acquire the knowledge, Architecture and schema and OLAP Tool concepts.	2	80	85	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-2 :	Acquire knowledge to design a data warehouse.	2	75	80	H		-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-3 :	Implement ETL Process in various data warehouse applications.	2	85	80	H		-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-4 :	Acquire knowledge to implement a data warehouse.	2	80	75	H		-		-	-	-	-	-	-	-	-	-	-	-
CLO-5 :	Implement the various concepts and applications of data mining rules and technology.	2	75	85	H	-	-	H	-	-	-	-	-	-	-	-	-	-	-
CLO-6 :	To Implement the data warehouse concepts in various organizations.	2	80	85	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Introduction to dataware housing	Data Warehouse Schema- Introduction	Building a data warehouse - Introduction	DATA MINING-introduction – Data – Types of Data – Data Mining Functionalities	Data Warehouse in Tamil Nadu government
	SLO-2	Introduction to data ware housing	Dimensional Modeling	Critical success factor	Integrating Data Mining with Data Warehouse	Data warehouse for ministry of commerce
S-2	SLO-1	Data warehousing Components	The Star Schema	Requirement Analysis	Data Mining Task Primitives	Data warehouse for the government of Andhra Pradesh
	SLO-2	Need for Data warehousing	The Snowflake Schema	Planning for the data warehouse	Data Preprocessing	Data warehouse for the government of Andhra Pradesh
S-3	SLO-1	Benefits and application of data warehouse	Aggregate Tables	Data warehouse design stage	Association rule mining and classification	Data warehouse in Hewlett Packard
	SLO-2	Data Warehouse Architecture Goals	DBMS Schemas for Decision Support	Building and implementing data marts	Frequent pattern Mining	Data warehouse in Hewlett Packard
S-4	SLO-1	Data Warehouse Architecture and Characteristics	Data Extraction	Building data warehouse	Apriori algorithm	Data warehouse in Levi Strauss
	SLO-2	Data Warehouse Architecture and Characteristics	Data transformation: Basic tasks	Backup and Recovery	Frequent pattern Mining without candidate generation	Data warehouse in Levi Strauss
S-5	SLO-1	Data Mart	Major transformation types	Establish the data recovery quality framework	Mining Multilevel Association Rules	Data warehouse in World Bank
	SLO-2	Data Mart	OLAP definition,	Operating the warehouse	Mining Multidimensional Association Rule, Correlation Analysis Rule	Data warehouse in World Bank

S-6	SLO-1	*Classification of data mart, Implementation*	*Dimensional Analysis*	*Recipe for a successful data warehouse*	*Classification: Decision Tree*	*HARBOR-A highly available data warehouse*
	SLO-2	*Classification of data mart, Implementation*	*Hypercube*	*Data warehouse pitfalls*	*Bayesian Classification-Naïve Bayes Classification*	*HARBOR-A highly available data warehouse*
S-7	SLO-1	*Gathering the business requirement*	*OLAP operations*	*Meta Data – Introduction*	*SVM Linear and Non linear data*	*A Typical Business Data Warehouse for a trading company*
	SLO-2	*Planning and project management- Project principles*	*Drill down*	*Meta Data – Data Management*	*Text Mining Temporal Data Mining and Spatial Data mining*	*A Typical Business Data Warehouse for a trading company*
S-8	SLO-1	*Data ware house readiness assessment, project team*	*Roll up*	*Meta Data – Query Generation*	*Cluster Analysis-Introduction*	*Customer Data warehouse of world's first and largest online bank in united kingdom*
	SLO-2	*Selecting the operating system*	*Slice*	*Meta Data – Query Generation*	*K-means– Partitioning Methods*	*Customer Data warehouse of world's first and largest online bank in united kingdom*
S-9	SLO-1	*Selecting the database software*	*OLAP models*	*Meta Data and Tools*	*Hierarchical Methods*	*A German supermarket Edeka's Data warehouse*
	SLO-2	*Selecting the tools*	*MOLAP*	*Meta Data and Tools*	*Data Mining Applications*	*A German supermarket Edeka's Data warehouse*

Learning Resources

1. *PaulrajPonniah,—DataWarehousing:FundamentalsforITProfessionals,WileyIndia.,2001.*
2. *Reema Theraja "Data Warehousing" by Oxford UniversityPress-2011.*
3. *DataMiningandDataWarehousingbyMs.KhushbooSaxena,Mr.Sandeepsaxena,Dr.AkashSaxenafirst edition 2015,BPBpublication,India*
4. *Prabhu CSR ,Data Warehousing Concepts, Technique, Product and application, PHI Learning private Ltd, Third Edition,2013.*
5. *SamAnahory,DennisMurray,DataWarehousingintheRealWorld,Pearsonpublication-2009*

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
K Selvanayagam, System Analyst, project Lead, Preludesys, Siruseri, Kancheepuram Dist.	*V.Masillamani, Asst Prof,IIITDM, Kancheepuram ,chennai*	*1.A.M.J Muthu Kumaran*
		2. S.A Saranya

Course Code	18CSE488T	Course Name	FUNCTIONAL PROGRAMMING	Course Category	E	Professional Elective	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 :	*Understand the basic building blocks of a functional programming language*
CLR-2 :	*Utilize different evaluations of functions*
CLR-3 :	*Utilize traits and case classes in functional programming*
CLR-4 :	*Utilize lists and collections*
CLR-5 :	*Utilize common structures in functional design*

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
		LevelofThinking (Bloom)	ExpectedProficiency (%)	ExpectedAttainment(%)	EngineeringKnowledge	ProblemAnalysis	Design&Development	Analysis,Design, Research	ModernTool Usage	Society&Culture	Environment& Sustainability	Ethics	Individual & TeamWork	Communication	ProjectMgt.&Finance	LifeLongLearning	PSO-1	PSO-2	PSO– 3
CLO-1 :	*Comprehend the usage of basic constructs of a functional programming language*	*3*	*80*	*70*	*L*	*H*	*H*	*H*	*H*	-	-	-	*L*	*L*	-	*H*	-	-	-
CLO-2 :	*Create the different types of functions and evaluate its operations*	*3*	*85*	*75*	*M*	*H*	*L*	*M*	*M*	-	-	-	*M*	*L*	-	*H*	-	-	-
CLO-3 :	*Create patterns and match the same with traits and case classes*	*3*	*75*	*70*	*M*	*H*	*M*	*H*	*H*	-	-	-	*M*	*L*	-	*H*	-	-	-
CLO-4 :	*Create lists and collections, evaluate its operations*	*3*	*85*	*80*	*M*	*H*	*M*	*H*	*H*	-	-	-	*M*	*L*	-	*H*	-	-	-
CLO-5 :	*Construct functional design for real world applications using common structures*	*3*	*85*	*75*	*H*	*H*	*M*	*H*	*M*	-	-	-	*M*	*L*	-	*H*	-	-	-
		3	*80*	*70*	*L*	*H*	*H*	*H*	*H*	-	-	-	*L*	*L*	-	*H*	-	-	-

Duration (hour)		**9**	**9**	**9**	**9**	**9**
S-1	SLO-1	*Programming Paradigms*	*Modules, Objects and Namespaces*	*Traits – Purpose and Syntax*	*Lists – Java vs Scala Lists*	*Functors - Purpose and Use*
	SLO-2	*Different types of programming paradigms, Functional vs OOP*	*Demo - Modules, Objects and Namespaces*	*Define a trait*	*Lists definitions and usage demo*	*Writing a simple functor*
S-2	SLO-1	*Scala Language Basics - Variables,*	*Anonymous Functions*	*Interface types*	*Working with Lists*	*Functor Laws*
	SLO-2	*Expressions*	*Polymorphic Functions, Nested Functions*	*Interface types examples*	*Constructing Lists*	*Applicatives – Concepts and use*
S-3	SLO-1	*Functions*	*Demo – Anonymous , Polymorphic and Nested Functions*	*Thick Interfaces*	*Basic operations on lists*	*Defining an applicative*
	SLO-2	*Recursion*	*Closures*	*Thin Interfaces*	*head, tail, isEmpty demo, List Patterns*	*Demo of Applicatives*
S-4	SLO-1	*Call By Name*	*Demo - Closures*	*Comparison - Thick vs Thin Interfaces*	*Lists - First Order methods*	*Traversable functors*
	SLO-2	*Call By Value*	*Repeated Parameters*	*Ordered trait*	*Examples of First Order Methods*	*Example – Traversable Functors*
S-5	SLO-1	*Conditionals*	*Tail Recursion*	*Demo – Ordered trait, Trait Comparisons*	*Lists - Higher Order methods*	*Monads*
	SLO-2	*Looping – for each and for*	*Demo – Tail Recursion*	*Traits for modifying interfaces*	*Examples of Higher Order Methods*	*Defining Monads*
S-6	SLO-1	*Significance of vals*	*Define a tail recursive function*	*Stacking modifications*	*Sequences – Overview and operations*	*Monad Laws*
	SLO-2	*Classes*	*Tracing tail-recursive functions*	*Recap – Traits and operations*	*Demo - Sequences*	*Demo – Monads and Monad Laws*
S-7	SLO-1	*Types*	*Demo – Tracing tail-recursive functions*	Mixin – Purpose & Composition	*Tuples - Overview and operations*	Monoid – Concept, Purpose and Use
	SLO-2	*Fields*	*Limits of tail-recursive functions*	Mixin Example	*Demo - Tuples*	Examples of Monoid
S-8	SLO-1	*Methods*	*Curried Functions*	Case Classes – Use, Definition	*Sets and Maps – Overview and operations*	Recap with more examples -Monads and Functors
	SLO-2	*Variable scope*	*Demo - Curried Functions*	Pattern Matching, Example	*Demo – Sets and Maps*	Recap with more examples -Applicatives
S-9	SLO-1	*Objects*	*Higher Order Functions - Definition and Uses*	Sealed Classes, Option Type	*Recap – Lists and Collections*	Applications – Functors, Monads
	SLO-2	*Singleton object, Variables of objects*	*Higher Order Functions Example*	Applications – Sealed Classes and Option Type	*Examples – Lists and Collections*	Applciations - Monads

Learning Resources	1. *Chiusano.P,BjarnasonR,FunctionalProgramminginScala,ManningPublications,2015* 2. *OderskeyM,SpoonL,VennersB,"ProgramminginScala",Thirdedition.*	3. *Hortsmann, C., Scala for the Impatient, 2nd ed., Addison-Wesley,2016.* 4. *Raychaudhuri R, Scala in Action, 1st ed. Manning Publications,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	*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
		Ms. K.Sornalakshmi
		Mr.R.Rajkumar

Course Code	18CSE489T	Course Name	STREAMING ANALYTICS	Course Category	E	Professional Elective	L	T	P	C
							3	0	0	3

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 :	Understand the basic building blocks of stream processing
CLR-2 :	Explore the data ingestion options into stream processing engines
CLR-3 :	Process streaming data in real time
CLR-4 :	Utilize NOSQL storage options to store real time data
CLR-5 :	Deliver stream processing results to end users

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
		LevelofThinking (Bloom)	ExpectedProficiency (%)	ExpectedAttainment (%)	Engineering	ProblemAnalysis	Design& Development	Analysis,Design Research	ModemToolUsage	Society&Culture	Environment& Sustainability	Ethics	Individual&Team Work	Communication	ProjectMgt.&Finance	LifeLongLearning	PSO-1	PSO-2	PSO-3
CLO-1 :	Comprehend the concepts and terminologies in stream processing	3	80	70	L	H	H	H	H	-	-	-	L	L	-	H	-	-	-
CLO-2 :	Create the data ingestion pipeline for a stream processing application	3	85	75	M	H	L	M	M	-	-	-	M	L	-	H	-	-	-
CLO-3 :	Create stream processing applications using Apache Storm and Spark Streaming	3	75	70	M	H	M	H	H	-	-	-	M	L	-	H	-	-	-
CLO-4 :	Store real time data using NoSQL databases	3	85	80	M	H	M	H	H	-	-	-	M	L	-	H	-	-	-
CLO-5 :	Construct stream data visualizations for users	3	85	75	H	H	M	H	M	-	-	-	M	L	-	H	-	-	-
		3	80	70	L	H	H	H	H	-	-	-	L	L	-	H	-	-	-

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Introduction to Stream Processing	Getting Started with Kafka	Apache Storm – Introduction	Apache Spark Streaming Introduction	NoSQL Data Bases
	SLO-2	Batch vs Stream Processing, Examples of stream processing	Why Kafka ? Publish Subscribe messaging model	Features of Storm	Spark's Memory Usage	Introduction to MongoDB
S-2	SLO-1	Map Reduce, Scalability and Fault Tolerance	Kafka Architecture	Storm Components	Understanding Resilience and Fault Tolerance in a Distributed System	MongoDB's Key Feature
	SLO-2	Applications of stream processing	Messages and Batches, Schemas	Nimbus, Supervisor Nodes	Spark's cluster manager	Data Model, Adhoc queries
S-3	SLO-1	Stateful Stream Processing	Topics and Partitions,	Zookeeper cluster	Data Delivery Semantics in Spark	Indexes, Querying
	SLO-2	Stream Processing Model	Producers and consumers	Storm Data Model	Data Delivery Semantics in Spark Applications	Replication, Speed and Durability
S-4	SLO-1	Data Sources, Stream processing pipelines, Sinks	Brokers and Clusters	Definition of a Storm topology, Operation modes in Storm	Microbatching	Scaling, MongoDB Change Streams
	SLO-2	Transformations and Aggregation	Multiple Clusters, Data Ecosystem	Storm – Prerequisites and Setting up a storm cluster, Developing a hello world example	Dynamic Batch Interval	Real-time data changes with Change Streams
S-5	SLO-1	Window Aggregations	Sending messages with producers	Storm topology options, Demo of Hello world in Storm	Structured Stream processing model	Visualizing Streaming data – Events, Logs, Records
	SLO-2	Stateless and stateful processing	Steps & Example - Sending messages with producers	Introduction to Storm UI	Spark Streaming Resilience Model	Dashboards
S-6	SLO-1	Effect of time in stream processing	Receiving messages with consumers	Cluster, Nimbus, Supervisor, Topology Summary. Nimbus Configuration	Data Structures in Spark – RDDs and DStreams	Visual Elements and Properties
	SLO-2	Lambda Architecture	Steps & Example - Receiving messages with consumers	Storm Scheduler	Spark Fault Tolerance Guarantees	Data Density
S-7	SLO-1	Kappa Architecture	Developing Kafka Streams Application	Types of schedulers	First Steps in Structured Streaming	Dividing time, Time to Live, Context
	SLO-2	Examples – Lambda & Kappa Architectures	Phases in a Kafka Streams Applciation Development	Applications of schedulers	Streaming Analytics Phases	Examples of Streaming Data Visualization
S-8	SLO-1	Streaming vs Batch Algorithms	Constructing a topology	Storm Cluster Monitoring	Acquiring streaming data	Visual Distractions and Visual Deception
	SLO-2	Applications – Streaming and Batch Algorithms	Streams and State – Applying stateful operations	Integration of Storm with Kafka	Transforming streaming data	Example – Stream processing visualization dashboards
S-9	SLO-1	Use of a Batch-Processing Component in a Streaming Application	Example application development with Kafka Streams	Integration of Storm with Kafka example	Output the resulting data	Streaming Visualization Techniques
	SLO-2	Recap – Stream Processing Fundamentals	Demo – Kafka Streams	Recap – Storm in Stream Processing	Demo – Stream Processing with Spark Streaming	Demo – Stream Processing visualizaton

Learning Resources	1. *Ellis B, Real-Time Analytics – Techniques to analyze and visualize streaming data, 1st ed., John Wiley & Sons Inc,2014* 2. *Andrade.H.C, Gedik B, Turaga D.S, "Fundamentals of Stream Processing: Application Design, Systems, and Analytics", 1st ed., Cambridge University Press,2014.* 3. *Narkhede N, Shapira .G, and Palino T., Kafka: The Definitive Guide - Real-Time Data and Stream Processing at Scale, 1st ed., O'Reilly Media, Inc.,2017.*	4. *Bejeck Jr. W.P., Kafka Streams in Action- Real-time apps and microservices with the Kafka Streams API, ", 1st ed., Manning Publications,2018* 5. *Jain.A, Mastering Apache Storm, 1st ed., Packt Publishing,2017.* 6. *Garillot F and Mass. G.,, Stream Processing with Apache Spark, 1st ed., O'Reilly Media, Inc.,2019.* 7. *https://docs.mongodb.com/manual/changeStreams/* 8. *Banker K., Bakkum P., Verch S., Garret D., Hawkins T., MongoDb in Action, ", 1st ed., Manning Publications, 2016* 9. *Arageus A, Visualizing Streaming Data, 1st ed., O'Reilly Media, Inc.,2018.*

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
		Ms.K.Sornalakshmi
		Ms.A.Saranya, Dr.Manju

Course Code	18CSE490T	Course Name	BIG DATA VISUALIZATION	Course Category	E	Professional Elective	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:	Learning		
		1	2	3
CLR-1 :	Understand the key techniques used in visualization which includes data models, graphical perception and techniques specifically for visual encoding and interaction	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-2 :	Obtain an exposure to common data domains and the corresponding analysis tasks which includes multivariate data and text			
CLR-3 :	Get hands-on experience in building and evaluating visualization systems			
CLR-4 :	Gain knowledge in data visualization aides			
CLR-5 :	Understand the significance of data by placing it in a visual context			
CLR-6 :	Utilize the knowledge by reading and discussing research papers from the visualization literature			

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 :	Design and exploring the result with data visualizations	3	75	70	L	M	M	M	L	-	-	-	M	L	M	M			
CLO-2 :	Conducting exploratory data analysis using visualization techniques and tools.	3	75	70	M	H	M	M	M	-	-	-	M	L	M	M			
CLO-3 :	Visual presentations of data for effective communication.	3	80	75	M	M	H	H	M	M	-	-	M	M	H	H			
CLO-4 :	Designing and evaluating color palettes for visualization based on principles of perception.	3	85	80	M	M	M	H	H	-	-	-	M	M	H	H			
CLO-5 :	Using the knowledge of perception and cognition to evaluate visualization design alternatives	3	85	80	M	H	M	H	H	-	-	-	M	M	H	H			
CLO-6 :	Identifying opportunities for the application of data visualization in various domains.	3	85	80	M	H	H	H	H	-	-	-	M	M	H	H			

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Introduction to Big Data Visualization	Definitions and explanations of visualization categories	An Introduction to Visualization tools	Introduction to D3	Case Studies: 1: Color considerations with a dark background
	SLO-2	Challenges of Big Data Visualization	Exploring R In big data	Visualization tools and big data	D3 and big data	
S-2	SLO-1	Categorization	Example with Patient Medical History	Example 1 – Sales transactions	Basic Examples	2: Leveraging animation in thevisuals you present
	SLO-2	Visualization Philosophies	Digging in with R	Adding more context	Getting started with D3	
S-3	SLO-1	Approaches to Big Data Visualization	No looping	Wrangling the data	D3 visualization sample templates	3: Logic in order
	SLO-2	Quality of Visualization	Comparisons and Contrasts	Trifacta Script panel	Big data visualization using D3	
S-4	SLO-1	Infographics versus Data Visualization	Tendencies	A visualization dashboard	Displaying Results Using D3	4: Strategies for avoiding thespaghetti graph
	SLO-2	Exploration versus Explanation	Dispersion	Experimenting with the data and build the visualization	Create a summary file for visualization	
S-5	SLO-1	Informative versus Persuasive versus Visual Art	Data quality categorized	Data pane_core details	Visualization using HTML document	5: Alternatives to pies
	SLO-2	Ingredients of Successful Visualizations	Data Manager	Constructing Dashboards	Data visualization showing the stacked view	
S-6	SLO-1	Choose Appropriate Visual Encodings-Natural Ordering, Distinct Values	Data Manager and big data	Saving and Presenting the work	Visual transitions	Final Thought
	SLO-2	Redundant Encoding , Defaults versus Innovative Formats , Readers' Context	Example-Reformatting-A little Setup	Visualization re-coloring, resizing, adding or changing labels		
S-7	SLO-1	Compatibility with Reality ,	Adding Script Code	Filters and Measure Names	Multiple donuts	Where to go from here

		Patterns and Consistency				
	SLO-2	*Selecting Structure*	*Executing the scene*	*Example-Promotion Spend Effect on Sales*	*Another twist on bar chart visualizations with examples*	
S-8	SLO-1	*Position: Layout and Axes*	*Status and relevance*	*Sales and spend*		*Building storytelling with data competency in yourteam or organization*
	SLO-2	*The Meaning of Placement and Proximity*	*Naming the nodes*	*Sales v Spend and Spend as % of Sales Trend*	*D3 Stacked Area via Nest template*	
S-9	SLO-1	*Patterns of Organization-Specific Graphs, Layouts, and Axis Styles*	*Consistency ,Reliability , Appropriateness*	*Tables and indicators*	*Adopting the sample*	
	SLO-2	*Appropriate Use of Circles and Circular Layouts*	*Accessibility and Other Output nodes*		*Visualization changes format*	

Learning Resources	1. *Big Data Visualization,James D. Miller,Copyright © 2017 Packt Publishing* 2. *Designing Data Visualizations,by Noah Iliinsky and Julie Steele,Copyright © 2011 Julie Steele and Noah Iliinsky. All rights reserved.Printed in the United States of America*	*3.Storytelling with data - a data visualization guide for business professionals by cole nussbaumer knaflic, Wiley publications* *4.Tableau Your Data! by Daniel G. Murray and the InterWorks BI Team, Wiley 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	40%	-	40%	-	30%	-	-	30%	30%	-
	Understand										
Level 2	Apply Analyze	40%	-	40%	-	50%	-	-	50%	40%	-
Level 3	Evaluate	20%	-	20%	-	20%	-	-	20%	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
Valiyullasha, Bugtreat Technologies, UK, ceo@bugtreat.com	***Prof.Shiv ram Dubey, IIIT Sricity, srdubey@iiits.in***	***Dr.Mangalraj,SRMIST,***
Saravanakarthick,Hewlett-Packard, India, saravanakarthick.chinniah@dxc.com	Prof. Bhawana Rudra, NITK suratkal,bhawanarudra@nitk.edu.in	***Dr.K.P.Vijayakumar,SRMIST***

Course Code	18CSE484T	Course Name	DEEP LEARNING	Course Category	E	Professional Elective	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 :	Understand the concepts of Neural Networks and Deep Learning
CLR-2 :	Understand Deep neural network and layered learning approach
CLR-3 :	Study and understand CNN and RNN for deep learning
CLR-4 :	Learn and understand Auto Encoders and its applications
CLR-5 :	Understand concept of transfer learning and its applications with keras

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
		LevelofThinking (Bloom)	ExpectedProficiency (%)	ExpectedAttainment(%)	EngineeringKnowledge	ProblemAnalysis	Design&Development	Analysis,Design,Research	ModernTool Usage	Society&Culture	Environment& Sustainability	Ethics	Individual & TeamWork	Communication	ProjectMgt.&Finance	LifeLongLearning	PSO-1	PSO-2	PSO– 3
CLO-1 :	Apply basic mathematical concepts in Deep Learning	2	80	85	H	L	-	-	H-	-	-	-	-	-	-	H	H	-	-
CLO-2 :	Work with powerful framework for supervised learning	3	75	80	H	H	-	-	H	-	-	-	-	-	-	H	H	H	M
CLO-3 :	Deal with Convolution Neural Networks	2	85	80	H	H	H	-	H	-	-	-	-	-	-	H	H	H	H
CLO-4 :	Analyze various types efficient data encoders	2	80	75	H	H	-	-	H	-	-	-	-	-	-	H	H	H	H
CLO-5 :	Apply various network models in deep learning	3	75	85	H	H	H	H	H	-	-	-	-	-	-	H	H	H	H

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Historical trends in deep learning – Machine Learning basics	Introduction to Simple DNN	Convolution Neural Networks Introduction	Encoder	Deep Architectures in Vision
	SLO-2	Learning algorithms – Supervised and Unsupervised Training	Platform for Deep Learning	Convolution Operation	Decoder	AlexNet to ResNet
S-2	SLO-1	Linear Algebra for machine learning	Deep Learning Software Libraries	Motivation	Auto Encoders Introduction	Transfer Learning
	SLO-2	Testing - Cross Validation	Deep Feed Forward Networks Introduction	Pooling	Auto Encoders	
S-3	SLO-1	Dimensionality Reduction	Learning XOR	Normalization	Under Complete Auto Encoder	Siamese Networks
	SLO-2	Over fitting /Under Fitting	Gradient-Based Learning	Applications in Computer Vision - ImageNet	Regularized Auto Encoder	
S-4	SLO-1	Hyper parameters and validation sets	Various Activation Functions, ReLU, Sigmoid – Error Functions	Sequence Modelling –VGGNet, LeNet	Stochastic Auto Encoder	Metric Learning
	SLO-2	Estimators – Bias - Variance	Architecture Design	Recurrent Neural Networks	Denoising Auto Encoder	Ranking / Triplet Loss
S-5	SLO-1	Loss Function-- Regularization	Differentiation Algorithms	RNN topologies- Difficulty in Training RNN	Contractive Auto Encoder	RCNNs with keras
	SLO-2	Biological Neuron – Idea of Computational units	Regularization methods for Deep Learning		Auto Encoder Applications	
S-6	SLO-1	McCulloch-Pitts units and Thresholding logic	Early Stopping	Long Short Term Memory	Dimensionality Reduction and Classification using Auto encoders	CNN-RNN
	SLO-2	Linear Perceptron	Drop Out		Recommendation	
S-7	SLO-1	Perceptron Learning Algorithm	Difficulty of training deep neural networks	Bidirectional LSTMs	Optimization for Deep Learning-Optimizers –RMS prop for RNNs	Applications in captioning and Video tasks
	SLO-2	Convergence theorem for Perceptron Learning Algorithm				
S-8	SLO-1	Linear Separability	Greedy layer wise training	Bidirectional RNNs	SGD for CNNs	3D CNNs
	SLO-2	Multilayer perceptron –The first example of network with Keras code				
S-9	SLO-1	Backprobagation	Optimization methods for Neural Networks-Adagrad, Adam	Application case study -Handwritten digits recognition using deep learning, LSTM with Keras – sentiment Analysis	Application case study – Image dimensionality reduction using encoders LSTM with Keras – sentiment Analysis	Application case study – Image recognition using RCNN and transfer learning
	SLO-2					

Learning Resources	1. *Ian Goodfellow,Yoshua Bengio,AaronCourville,"DeepLearning",MITPress,2016.* 2. *Kevin P.Murphy,"Machine Learning:AProbabilisticPerspective",MITPress,2012.*	3. *Neural Networks: A Systematic Introduction, RaulRojas, 1996.* 4. *Christopher and M.Bishop,"Pattern Recognition and Machine Learning",Springer Science Business Media, 2006.* 5. *JasonBrownlee,"Deep Learning with Python",ebook,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 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
1.	*1.*	*1. Dr.E.Poovammal*
2.	*2.*	*2. Dr.G.Vadivu*
		3. Mr.Joseph James

Course Code	18CSE491T	Course Name	MACHINE LEARNING - II	Course Category	E	Professional Elective	L	T	P	C
							3	0	0	3

Pre-requisite Courses	18CSE392T	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	CSE	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 Fundamentals of machine Learning Experiments			
CLR-2 :	Design and implement Ensemble learning methods			
CLR-3 :	To provide deeper understanding of Reinforcement Learning and its Elements			
CLR-4 :	Understand and Implement Neural Network Algorithms			
CLR-5 :	Understand the concepts of Deep Learning Algorithms			
Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	LevelofThinking (Bloom)	ExpectedProficiency (%)	ExpectedAttainment (%)
CLO-1 :	Design and Analyze Machine Learning Experiments	2	80	85
CLO-2 :	Learn and Understand Graphical Model Learning and ensemble learning	2	75	80
CLO-3 :	Understand the concept of Reinforcement learning	2	85	80
CLO-4 :	Study the neural network systems for machine learning	2	80	75
CLO-5 :	Learn and Implement Deep Learning algorithms	2	75	85

Program Learning Outcomes (PLO)														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
EngineeringKnowledge	ProblemAnalysis	Design&Development	Analysis,Design, Research	ModernTool Usage	Society&Culture	Environment& Sustainability	Ethics	Individual & TeamWork	Communication	ProjectMgt.&Finance	LifeLongLearning	PSO-1	PSO-2	PSO– 3
H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
H	H	-	-	H	-	-	-	-	-	-	-	-	-	-
H	H	-	-	-	-	-	-	-	-	-	-	-	-	-
H	H	-	-	H	-	-	-	-	-	-	-	-	-	-
H	H	-	H	H	-	-	-	-	-	-	-	-	-	-

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Introduction to machine learning	Graphical Models	Reinforcement Learning	Neural Networks representations	Feature selection
	SLO-2	Basic probability theory	Bayesian belief networks	K-Armed Bandit	***McCulloch-Pitts units***	Feature extraction
S-2	SLO-1	linear algebra	Markov random fields	Elements of reinforcement learning	***Thresholding logic***	Deep Learning
	SLO-2			Model based learning	Perceptron	Deep learning python libraries
S-3	SLO-1	Factors		Value iteration	Feed forward networks	Simple DNN
	SLO-2	Response and strategy of Experimentation	Naïve Bayes classifiers	policy iteration	Multi-layer perceptron	Activation functions
S-4	SLO-1	Randomization, Replication and Blocking	Markov models	Temporal difference learning	Back propagation algorithms	Regularization methods
	SLO-2	Guidelines for machine learning Experiments	Hidden Markov models	Exploration strategies		
S-5	SLO-1	Cross validation and resampling methods	Ensemble learning methods	Deterministic and Non-deterministic rewards and actions	Convergence and Hidden layer representation in back propagation	Convolutional Neural Networks
	SLO-2	Measuring classifier performance	Voting, Boosting, Adaboost		Optimization Algorithms	
S-6	SLO-1	Interval estimation	Gradient Boosting	Semi-supervised learning	Gradient Decent	Recurrent Neural Networks
	SLO-2	Hypothesis testing	Bagging		Stochastic gradient	
S-7	SLO-1	Assessing a Classification Algorithm's performance	Random Forest	Computational learning theory	Adam, Adagrad	LSTM
	SLO-2	Comparing two classification Algorithms			RMSProp	Sentiment analysis with LSTM keras code
S-8	SLO-1	Comparing multiple Algorithms	Fine Tuning Ensemble	VC dimension	Drop out	Auto encoders
	SLO-2		Cascading		Batch Normalization	
S-9	SLO-1	Comparison over multiple Datasets	Application Face recognition using Ensemble techniques	PAC learning	Application Face recognition using Neural Networks	Dimensionality reduction using Auto Encoders
	SLO-2					

Learning Resources	1. *KevinP.Murphy,"MachineLearning:AProbabilisticPerspective",MITPress,2012.* 2. *EthemAlpaydin,"IntroductiontoMachineLearning",PrenticeHallofIndia,2005* 3. *Tom Mitchell, "Machine Learning", McGraw-Hill,1997.*	4. *Sebastian Raschka, VahidMirjilili,"Python Machine Learning and deep learning", 2nd edition, kindle book,2018* 5. *IanGoodfellow,YoshuaBengio,AaronCourville,"DeepLearning",MITPress,2016.* 6. *JasonBrownlee,"DeepLearningwithPython",ebook,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 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
		1. Dr.G.Vadivu
		2. DrUshaKrithika 3. Mr. S. JosephJames

Course Code	18CSO101T	Course Name	IT INFRASTRUCTURE MANAGEMENT	Course Category	O	Open Elective	L	T	P	C
							3	0	0	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science& Engg.	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	Understand the design factors and challenges in IT Infrastructure Management
CLR-2 :	Understand service delivery and associated processes
CLR-3 :	Understand storage and security management related to IT Infrastructure
CLR-4 :	Understand performance and tuning processes and associated case studies
CLR-5 :	Understand the suitable for combinations in information technology, business administration and electronic commerce.

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
		LevelofThinking (Bloom)	ExpectedProficiency (%)	ExpectedAttainment(%)	EngineeringKnowledge	ProblemAnalysis	Design&Development	Analysis,Design, Research	ModernTool Usage	Society&Culture	Environment& Sustainability	Ethics	Individual & TeamWork	Communication	ProjectMgt.&Finance	LifeLongLearning	PSO-1	PSO-2	PSO–3
CLO-1 :	Be able to describe the business value and processes of ICT services in an organization and apply that knowledge and skill with initiative to a workplace scenario	2	80	85	L	-	L	H	L	-	-	-	H	H	M	L	-	-	-
CLO-2 :	Be able to investigate, critically analyze and evaluate the impact of new and current ICT services to an organization	2	75	80	M	-	-	H	H	-	-	-	L	L	L	H	-	-	-
CLO-3 :	Be able to describe how effective IT Infrastructure Management requires strategic planning with alignment from both the IT and business perspectives in an organization	2	85	80	M	L	M	H	L	-	-	-	M	H	H	H	-	-	-
CLO-4 :	Be able to demonstrate the technical and communications skills that contribute to the operation of ICT services in an organization	2	80	75	M	L	L	L	-	-	-	-	H	H	M	L	-	-	-
CLO-5 :	Be able to reflect critically on the role of an enterprise architect in an organization	2	75	85	L	-	L	L	-	-	-	-	L	L	H	L	-	-	-
CLO-6 :	Be able to synthesize the theoretical, technical and management issues that deliver ICT services to an organization	2	80	85	H	-	L	L	L	-	-	-	L	L	H	L	-	-	-

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Introduction – IT Infrastructure	Service Delivery And Support Process - Intro	Storage And Security Management - Intro	Performance And Tuning Process	Case Studies
	SLO-2	Challenges in IT Infrastructure Management		Backup and Storage, Archive & Retrieve		
S-2	SLO-1	Design Factors for IT Organizations	Service Level Management	Space Management	Introduction on tuning process	Asset Network Corporation case
	SLO-2	Design Factors for IT Infrastructures				
S-3	SLO-1	Determining customer's Requirements, Identifying System Components to manage	Financial Management	Hierarchical space management	Difference between Performance and Tuning processes and other Infrastructure processes	Radio Shack case
	SLO-2					
S-4	SLO-1	Identifying System Components to manage	IT Service Continuity Management	Database & Application protection	Definitions	Business Process Outsourcing (BPO) Infrastructure Planning and Management
	SLO-2					
S-5	SLO-1	Exist Processes, Data, applications,	Capacity Management	Disaster Recovery Bare Machine Recovery (BMR)	Preferred characteristics	e-Commerce Business Infrastructure Planning and Management
	SLO-2					
S-6	SLO-1	Tools and their integration	Configuration Management	Data Retention	Performance and tuning applied to major resource environments	Enron case
	SLO-2					
S-7	SLO-1	IT Systems and Service Management Process	Service desk, Incident management	Computer Security Identity Management	Assessing an Infrastructure's performance and tuning process	Tycocase
	SLO-2					

S-8	SLO-1	*Information systems Design Process*	*Availability management,*	*Access control system*	*Measuring and streamlining the P and T process*	*Worldcom case*
	SLO-2					
S-9	SLO-1	*IT Infrastructure Library*	*Release Management*	*Intrusion Detection*	*Performance tuning recommendations for data and event management*	*Analyze an information infrastructure – case study*
	SLO-2					

Learning Resources	1. *Rich Schiesser, " IT Systems Management", 2nd edition, 2010, Pearson Education, ISBN: 978-0137025060* 2. *P.Gupta,"ITInfrastructureandItsManagement"2ndReprint,2010,TataMcGrawHill,ISBN: 978-0070699793* 3. *SjaakLaan,"ITInfrastructureArchitecture:InfrastructureBuildingBlocksandConcepts",2011, Lulu Press Inc, ISBN978-1-4478-8128-5.*	4. *LeonardJessup,JosephValacich,"InformationSystemToday:ManagingDigitalWorld",3rdEdition, 2007, Prentice Hall, ISBN:0-13-233506-9.* 5. *Hausman,Cook,"ITArchitectureforDummies",2011,WileyPublishing,Hoboken,NJ www.wiley.com ISBN:978-0-470-55423-4* 6. *RichardJ.Reese,"ITArchitectureinAction",2008,XlibrisPublishing,ISBN:978-1-4363-0505-1*

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
1. Mr. Mohamed Yaseen MS, Technical Business Analyst, CBA - Sydney, Australia, yasucseau@gmail.com	*1.* Dr.J.Baskar Babujee, Associate Professor, Madras Institute of Technology,Chennai. baskarjee@annauniv.edu	*1. Dr. C.N.S.Vinoth Kumar, SRMIST*
2. Mr.P.AnandaNatarajan,Senior Associate Consultant, Infosys, Chennai., anand_adnan@yahoo.com		*2. Dr. MB.Mukesh Krishnan, SRMIST*

Course Code	18CSO102T	Course Name	MOBILE APPLICATION DEVELOPMENT	Course Category	O	Open Elective	L	T	P	C
							3	0	0	3

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	Understand the basics of Android devices andPlatform.
CLR-2 :	Acquire knowledge on basic building blocks ofAndroid programming required for Appdevelopment.
CLR-3 :	Understand persistence Data storage mechanismin Android
CLR-4 :	Understand advanced application concepts likenetworking, Animations and Google Maps services etc.
CLR-5 :	Develop and publish Android applications in toAndroid Market
CLR-6 :	

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
		LevelofThinking (Bloom)	ExpectedProficiency (%)	ExpectedAttainment(%)	EngineeringKnowledge	ProblemAnalysis	Design&Development	Analysis,Design, Research	ModernTool Usage	Society&Culture	Environment& Sustainability	Ethics	Individual & TeamWork	Communication	ProjectMgt.&Finance	LifeLongLearning	PSO-1	PSO-2	PSO– 3
CLO-1 :	Acquire the knowledge on Android devices and Platform	2	80	85	L	-	-	-	H	-	-	-	-	-	-	-	-	-	-
CLO-2 :	Acquire knowledge on basic building blocks ofAndroid programming required for Appdevelopment.	2	75	80	L	-	H	-	-	-	-	-	-	-	-	-	-	-	-
CLO-3 :	Apply the knowledge of persistence Data storage mechanismin Android	2	85	80	-	-	H	-	-	-	-	-	-	-	-	-	-	-	-
CLO-4 :	Apply the knowledge in advanced application concepts likenetworking, Animations and Google Maps services etc.	2	80	75	L	-	H	-	H	-	-	-	-	-	-	-	-	-	-
CLO-5 :	Design and apply the knowledge to publish Android applications in toAndroid Market	2	75	85	H	-	-	H	-	-	-	-	-	-	-	-	-	-	-
		2	80	85	-	-	H	-	-	-	-	-	-	-	-	-	-	-	-

Duration (hour)		9	9	7	10	10
S-1	SLO-1	Introduction: Introduction to mobile application development, trends.	GUI for Android: Introduction to activities life-cycle	Introduction to Different Data persistence schemes	Services :introduction to services– localservice,	Introduction to Location based services
	SLO-2					
S-2	SLO-1	introduction to various platforms,	Android v7 supportlibrary form API21 for lower versionsupport	Shared preferences	remote service and binding theservice,.	Google maps V2 services using Google API.
	SLO-2					
S-3	SLO-1	introduction to smart phones	Intent :intent object	File Handling se	the communication between serviceand activity, Intent Service	Animations and Graphics: PropertyAnimation .
	SLO-2					
S-4	SLO-1	Android platform: Android				
	SLO-2	platform,features and architecture,	intent filters ,addingcategories	Managing data using SQLite databa	MultiThreading: Handlers	View Animations, DrawableAnimations
S-5	SLO-1	versions ,comparison added features in	linking activities, user interfacedesign	Content providers:	,AsyncTask	Media and Camera API: Working withvideo and audio inputs
	SLO-2	each versions.	components			
S-6	SLO-1		Views and View Groups: Basic			
	SLO-2	ART(Android Runtime),ADB(AndroidDebug Bridge).	views,picker views, adapter views, Menu, App Baretc, basics of screen design; differentlayouts.	user content provider	android network programming:HttpUrlConnection	Camera API
S-7	SLO-1	Development environment/IDE: Android	App widgets.Lollipop Materialdesign: new	Android in build content providers		Sensor programming: Motion sensors
	SLO-2	studio and its working environment	themes, new widgets,Cardlayouts. RecyclerView		Connecting to REST-based and SOAP based Web services	
S-8	SLO-1				Broad	
	SLO-2	gradle build system, emulator setup	Fragments: Introduction to activities,		castreceivers:LocalBroadcastManager,Dynamic broadcast receiver	Position sensors, Environmental sensors.

S-9	SLO-1 SLO-2	*Application anatomy: Applicationframework basics: resources layout, values,asset XML representation and generatedR.Javafile ,Android manifest file. Creating asimple application.*	*activities life-cycle.*		*System Broadcast. PendingIntent, Notifications*	*Publishing Android Apps: Guide lines.*
S-10					*Telephony Manager:Sending SMS andmaking calls.*	*policies and process of uploading Apps toGoogle play*

Learning Resources	1. *Dawn Griffiths, David Griffiths,"Head First: Android Development" ,OReilly2015,ISBN:9781449362188.* 2. *Greg Milette,Adam Stroud,"PROFESSIONALAndroid™ Sensor Programming", John Wiley and Sons, Inc2012,ISBN/978111265055,9781280678943,978111227459* 3. *PaulDeital,HarveyDeital,AlexanderWald,"Android6forProgrammers,AppDrivenapproach",2015, Prentice Hall ,ISBN:9780134289366.* 4. *http://developer.android.com/training/index.htmlas on Date21.4.2016*

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 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
1.	***1. Dr.KHANNA NEHEMIAH , Professor,Ramanujan Computing, Anna University***	***1. Dr.M.UMA***
		2. Dr.Ganesh Kumar, SRMIST
		3.Mr.K.Naveen

Course Code	18CSO103T	Course Name	SYSTEM MODELING AND SIMULATION	Course Category	O	*Open Elective*	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 :	*Select a suitable modeling method according to problem area and assignment, and justify their choice.*
CLR-2 :	*Formulate models of a system to describe the system on different levels of abstraction and from different viewpoints.*
CLR-3 :	*Learn and apply the continuous system simulation*
CLR-4 :	*Learn theory and probability concepts in simulation*
CLR-5 :	*Learn the simulation languages and tools*

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	Learning			Program Learning Outcomes (PLO)														
		1 Level of Thinking (Bloom)	2 Expected Proficiency (%)	3 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 :	*Implement the appropriate modeling method for the given problem*	*2*	*80*	*85*	*H*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-2 :	*Explain the system abstraction in different levels*	*2*	*75*	*80*	*H*	*H*	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-3 :	*Apply the models under continuous system simulation*	*2*	*85*	*80*	*H*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-4 :	*Analyze the probability concepts for simulating a system*	*2*	*80*	*75*	*H*	*H*	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-5 :	*Apply tools to like GPSS and SIMSCRIPT to check model properties of a system*	*2*	*75*	*85*	*H*	-	-	*H*	-	-	-	-	-	-	-	-	-	-	-

Duration (hour)		**9**	**9**	**9**	**9**	**9**
S-1	**SLO-1**	***Introduction to system modelling***	Continuous System Simulation - Introduction	Probability Theory	Queueing Theory - Introduction	General description of GPSS and SIMSCRIPT
S-2	**SLO-1**	***Modeling principles and concepts***	Numerical solution of differential equations	Probability CONCEPTS IN SIMULATION -	Arrival Pattern distributions	programming in GPSS
S-3	**SLO-1**	***Continuous systems and Discrete systems***	Analog computers	Monte Carlo techniques	servicing times, queuing disciplines	***Application of GPSS on specific problem***
S-4	**SLO-1**	Modeling, types of models,subsystems	Hybrid computers	Application of Monte Carlo techniques	measure of queues	Simulation Programming Techniques
S-5	**SLO-1**	corporate model, system study..	continuous system simulation languages CSMP	Stochastic variables	mathematical solutions to queuing problems	Data Structures
S-6	**SLO-1**	System Simulation: Techniques,	system dynamic growth models,	probability functions	Discrete system simulation: Events	Implementation of activities
S-7	SLO-1	comparison of simulation and analytical methods	logistic curves	Random Number Generation algorithms	Generation of arrival pattern	Events and queues, event scanning
S-8	SLO-1	types of simulation, distributed log models	***Illustration of Continuous System Simulation***	***Illustration of Probability concepts***	Simulation programming tasks	Simulation algorithms in GPSS and SIMSCRIPT
S-9	SLO-1	cobweb models	***Case Study***	***Case Study***	Analysis of simulation output	***Case Study***

Learning Resources	1. Geoffery Gordon, " System Simulation" , PHI, 2nd edition 2. Jerry Banks , John S.Carson ,Barry Nelson, David M.Nicol, "Discrete – Event System Simulation", PHI, 3rd edition 3. Karian. Z.A., Dvdewicz .E.Z, "Modern Statistical Systems and GPSS Simulation",Freeman, 1991	

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
		1. Prof.S.S.Sridhar, SRMIST
		2. Mr. C.Arun, SRMIST

Course Code	18CSO104T	Course Name	FREE AND OPEN SOURCE SOFTWARES	Course Category	O	Open Elective	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:	Learning		
		1	2	3
		LevelofThinking	ExpectedPro-ficiency%	ExpectedAttainment%
CLR-1 :	Be exposed to the context and operation of free and open source software (FOSS) communities and associated software projects.			
CLR-2 :	Be familiar with participating in a FOSS project			
CLR-3 :	Learn scripting language like Python or Perl, Ruby			
CLR-4 :	Learn some important FOSS tools and techniques			
Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*			
CLO-1 :	Install and run open-source operating systems.	3	80	70
CLO-2 :	Gather information about Free and Open Source Software projects from software releases and from sites on the internet.	3	85	75
CLO-3 :	Build and modify one or more Free and Open Source Software packages.	3	75	70
CLO-4 :	Contribute software to and interact with Free and Open Source Software development projects.	3	85	80
CLO-5 :	Identify and apply various linux commands	3	85	75

Program Learning Outcomes (PLO)														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
EngineeringKnowledge	ProblemAnalysis	Design&Development	Analysis,Design, Research	ModernTool Usage	Society&Culture	Environment& Sustainability	Ethics	Individual & TeamWork	Communication	ProjectMgt.&Finance	LifeLongLearning	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	Introduction-	Linux Installation and Hardware Configuration	Unix file system, Unix files, i-nodes and structure and file system relatedcommands	Usage of design Tools like Argo UML or equivalent	Open Source Software Development
	SLO-2	Open Source, Free Software, Free Software vs. Open Source software				
S-2	SLO-1	FOSS examples	Boot Process-The Linux Loader (LILO)	Shell Programming, Shell as command processor, Shell variables	Version Control Systems like Git or equivalent	Case Study – Libreoffice -Samba
	SLO-2	FOSS Characteristics	The Grand Unified Boot loader (GRUB)			
S-3	SLO-1	FOSS History, Examples	Dual-Booting Linux and other Operating System	Creating command substitution, Scripts	Bug Tracking Systems	
	SLO-2	FOSS Copyright	Boot-Time Kernel Options			
S-4	SLO-1	Guidelines for effectively working with FOSS community	Basic Linux Commands	Creating commands for Functions, Conditionals	Package Management Systems	
	SLO-2					
S-5	SLO-1	Benefits of Community based Software Development	Linux Commands for operations - redirection, pipes, filters, job control, changing ownership/permission of files/directories	Creating commands for loops	Introduction to Programming language using Python	
	SLO-2					
S-6	SLO-1	Requirements for being open, free software, open source software	Advanced Linux Commands like curl, wget, ftp, ssh and grep	Customizing environment	Basic commands, variables, Decision Making, Lists, Modules, strings, looping,	Case Studies : Apache, BSD, Linux, Mozilla (Firefox), Wikipedia, Joomla, GCC,
	SLO-2					

S-7	SLO-1	Four degrees of freedom	X Windows System Configuration	Shell scripting for system configurations	conditional statements, classes, Exceptions packages	Open Office
	SLO-1					
S-8	SLO-1	FOSS Licensing Models	System Administration	Shell scripting with functions and conditions		
	SLO-2	FOSS Licenses – GPL- AGPL- LGPL – FDL	Backup and Restore Procedures			
S-9	SLO-1	Implications	Strategies for keeping a Secure Server	Shell scripting with looping		
	SLO-2					

Learning Resources	1. EllenSiever,StephenFiggins,RobertLove,ArnoldRobbins,"LinuxinaNutshell",Sixth Edition, OReilly Media, 2009. 2. LinuxProgrammingBiblebyJohnGoerzen,IDGBooks,NewDelhi,2000. 3. Your Unix - The Ultimate Guide by Sumitabha Das, TMH,2000	4. PerlProgrammingbookathttp://www.perl.org/books/beginning-perl/. 5. Rubyprogrammingbookathttp://ruby-doc.com/docs/ProgrammingRuby/. 6. Samba: URL :http://www.samba.org/.

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
1.Bijoymon Soman *Sr. Test Analyst* *UST Global,* *Philadelphia,PA, USA*	*1. Dr.Arun kumar M N* *Assistant Professor,* *Federal Institute of Science and Technology,* *Angamaly, Kerala*	*1. Mrs Aswathy K Cherian, SRMIST*
		2.Mrs. Nimala , SRMIST

Course Code	18CSO105T	Course Name	ANDROID DEVELOPMENT	Course Category	O	Open Elective	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 :	Understand the basics of Android devices and Platform.
CLR-2 :	Acquire knowledge on basic building blocks of Android programming required for Application development
CLR-3 :	Gain knowledge to user interfaces used in android applications
CLR-4 :	Acquire knowledge on advanced application concepts like networking, Animations and Google Maps services etc
CLR-5 :	Develop and publish Android applications in to Android Market
CLR-6 :	Understand the knowledge of JSON and MQTT

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
		LevelofThinking (Bloom)	ExpectedProficiency (%)	ExpectedAttainment(%)	EngineeringKnowledge	ProblemAnalysis	Design& Development	Analysis,Design, Research	ModernTool Usage	Society&Culture	Environment& Sustainability	Ethics	Individual & TeamWork	Communication	ProjectMgt.&Finance	LifeLongLearning	PSO-1	PSO-2	PSO– 3
CLO-1 :	To exposed to technology and business trends impacting Android Platform	2	80	85	H	-	L	-	-	-	-	-	-	-	-	-	-	-	-
CLO-2 :	Be competent with the characterization and architecture of mobile applications	2	75	80	L	H	H	-	-	-	-	-	-	-	-	-	-	-	-
CLO-3 :	To understanding enterprise scale requirements of mobile applications	2	85	80	H	-	H	L	-	-	-	-	-	-	-	-	-	-	-
CLO-4 :	To designing and developing mobile applications using one application development framework	2	80	75	L	L	H	-	-	-	-	-	-	-	M	-	-	-	-
CLO-5 :	To understand how to handle and share android data	2	75	85	L	-	H	H	L	-	-	-	-	-	-	-	-	-	-
CLO-6 :	To develop an android services and to publish android application for use	2	80	85	H	-	H	-	-	-	-	-	-	-	M-	-	-	-	-

Duration (hour)		9	9	9	9	9
S-1	SLO-1	*Creating a new Android Project*	Hosting a UI Fragment	Action Bar and Options Menus	Loopers, Handlers, and HandlerThread	Introduction to JSON
	SLO-2	*Defining the Project and SDK setting*	Creating a UI Fragment	Enabling Ancestral Navigation	Creating a search interface	JSON and Android
S-2	SLO-1	*Creating an Android Virtual Device (AVD) in Android Studio*	Adding a UI Fragment to the FragmentManager	An Alternative Menu Item	Hardware search button	Designing JSON and JSON Operation
	SLO-2	*Android Virtual Device (AVD) in Android Studio*	The FragmentManager and the fragment lifecycle	Saving and Loading Local Files	Creating an IntentService	Server reachability and Connection & Splash App
S-3	SLO-1	*Configuring the Android Studio AVD Emulator*	Creating User Interfaces with Layouts and Widgets	Context Menu Resource	Delayed Execution with AlarmManager	Lazy Loading Images
	SLO-2	*The Emulator Environment and Toolbar Options*	XML Layout Attributes	Floating Context Menu	Broadcast Intents	Lazy loading Libraries
S-4	SLO-1	*Extended Control options*	the Graphical Layout Tool	Contextual Action Mode	Waking Up on Boot	Lazy loading Archirtecture
	SLO-2	*Drag and Drop Support*	Creating a ListFragment	Camera I: Viewfinder	Filtering Foreground Notifications	Handling Image Assets
S-5	SLO-1	*Configuring Fingerprint Emulation*	Hosting a Fragment	Using the Camera API	Receivers and Long-running Tasks	Remote Crash Logs and App
	SLO-2	*Android Studio Apps on a Physical Android Device*	ListFragment, ListView and ArrayAdapter	Camera II: Taking Pictures and Handling Images	Browsing The Web & WebView	Push Messaging Services
S-6	SLO-1	*Enabling ADB on Android based Devices*	Fragment Arguments	Updating the Model Layer	Custom Views and Touch Events	Firebase Cloud Messaging
	SLO-2	*Android Studio Editor*	ViewPager	Updating CrimeFragment's View	Creating BoxDrawingView	Open Source Push Messaging with MQTT
S-7	SLO-1	*Splitting the Editor Window, Code Completion, Statement Completion*	Dialogs	Implicit Intents	Handling Touch Events	MQTT App and Project
	SLO-2	*Parameter Information, Parameter Name Hints,*	Audio Playback Using MediaPlayer	Two-Pane Master-Detail Interfaces	Tracking the Device's Location	Message Brokers
S-8	SLO-1	*Code Generation*	Retained Fragments	Adding Layout Flexibility	Locations and the LocationManager	MQTT Broker setup for AWS
	SLO-2	*Code Folding*	Rotation and Retained Fragments	Activity: Fragment Boss	Receiving Broadcast Location Updates	Sending Messages with MQTT Web Clients

S-9	SLO-1	*Quick Documentation Lookup*	Rotation Handling and onSaveInstanceState(Bundle)	Styles And Includes	Updating the UI with Location Data	Firebase Cloud Messaging
	SLO-2	*Code Reformatting*	Localization	Cleaning Up with Styles	Testing Locations on Real and Virtual Devices	MQTT Push Messaging

Learning Resources	1. *Neil Smyth, Kotlin / Android Studio 3.0 Development Essentials - Android 8 Edition, Payload Media, Inc.2017* 2. *BillPhillipsandBrianHardy,AndroidProgramming:TheBigNerdRanchGuide,BigNerdRanch,Inc. 2013*	3. *MarkWickham,PracticalAndroid:14CompleteProjectsonAdvancedTechniquesandApproaches, Apress,2018* 4. *DavidGriffiths,HeadFirst:AndroidDevelopment,OReilly2015,ISBN:9781449362188*

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
1. *DineshBabuT,DevelopmentManager,HPIndia.dinesh.thavamani@hp.com*		1. *Mr.S.Pradeep,SRMIST*
2. *SurajSundaram,AssociateITConsultant,TCSCanada.suraj.s@tcs.com*		2. *Mr. C. Arun,SRMIST*

Course Code	18CSO106T	Course Name	DATA ANALYSIS USING OPEN SOURCE TOOL	Course Category	O	Open Elective	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 :	Understand and write programs in R
CLR-2 :	Gain knowledge on the working of statistical data in R
CLR-3 :	Gain knowledge on Linear regression and manipuatlation in R
CLR-4 :	Acquire knowledge on classification and clustering in R
CLR-5 :	Acquire knowledge on Linear Model selection and regulaization and working it in R
CLR-6 :	Introduce the Tree baed methods and working it in R

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
		LevelofThinking (Bloom)	ExpectedProficiency (%)	ExpectedAttainment(%)	EngineeringKnowledge	ProblemAnalysis	Design&Development	Analysis,Design, Research	ModernTool Usage	Society&Culture	Environment& Sustainability	Ethics	Individual & TeamWork	Communication	ProjectMgt.&Finance	LifeLongLearning	PSO-1	PSO-2	PSO– 3
CLO-1 :	Acquire the knowledge on data analysis in R	2	80	85	H	-	-	-	H	-	-	-	-	-	-	-	-	-	-
CLO-2 :	Acquire the ability to find meaning pattern using R	2	75	80	H	H	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-3 :	Acquire the ability to find graphically interpret data in R	2	75	80	H	H	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-4 :	Apply the knowledge for implementing anlaytical alogirthms	2	80	75	H		-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-5 :	Handle large scale analytics projects from various domains	2	75	85	H	H	-	H	-	-	-	-	-	-	-	-	-	-	-
CLO-6 :	Develop intelligent decision support systems	2	75	80	H	-	-	H	-	-	-	-	-	-	-	-	-	-	-

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Data in data analytics	Simple Linear Regression	An Overview of Classification	Cross-Validation The Validation Set Approach	The Basics of Decision Trees- Regression Trees
	SLO-2	NOIR classification	Estimating the coefficients	Logistic Regression - The Logistic Model	Leave-One-Out Cross-Validation	Classification Trees
S-2	SLO-1	Introduction to R	Assessing the Accuracy of the Coefficient Estimates	Estimating the Regression Coefficients	k-Fold Cross-Validation	Trees Versus Linear Models
	SLO-2	Data types	Assessing the Accuracy of the Model	Making Predictions	Bias-Variance Trade-Off for k-Fold Cross-Validation	Advantages and Disadvantages of Trees
S-3	SLO-1	Control structures	Libraries for Simple Linear Regression in R	Multiple Logistic Regression	The Validation Set Approach in R	Bagging -Random Forests
	SLO-2	Control structures - Using the console	Programming in simple linear regression in R	Logistic Regression for >2 Response Classes	Leave-One-Out Cross-Validation in R	Boosting
S-4	SLO-1	Objects in R - Numbers, Attributes	Multiple Linear Regression - Estimating the Regression Coefficients	Linear Discriminant Analysis - Using Bayes' Theorem for Classification	k-Fold Cross-Validation .in R	Fitting Classification Trees in R
	SLO-2	Vectors - create vectors	Multiple Linear Regression in R	Linear Discriminant Analysis for p = 1	The Bootstrap in R	Fitting Regression Trees in R
S-5	SLO-1	Using [] brackets	Extensions of the Linear Model	Linear Discriminant Analysis for p>1	Linear Model Selection and Regularization- Subset Selection	Bagging and Random Forests in R
	SLO-2	Vectorized operations	Potential Problems	Quadratic Discriminant Analysis	Stepwise Selection Choosing the Optimal Model	Boosting in R
S-6	SLO-1	Matrix -building a matrix, Naming dimensions, Colnames and Rownames	The Marketing Plan	Logistic Regression, LDA,	Shrinkage Methods Ridge Regression	Principal Components Analysis - What Are Principal Components?
	SLO-2	Matrix operations, Visualizing with Matplot()	Comparison of Linear Regression with K-Nearest Neighbors	QDA, and KNN in R - T	The Lasso Selecting the Tuning Parameter	More on PCA

S-7	SLO-1	*Data frame*	*Qualitative Predictors*	*Example using Stock Market Data*	*Dimension Reduction Methods Principal Components RegressionP*	*Principal Components Analysis in R*
	SLO-2	*List*	*Extensions of the Linear Model*	*Logistic Regression in R*	*artial Least Squares*	*More on PCA - Other Uses for Principal Components*
S-8	SLO-1	*Functions*	*Interaction Terms in R*	*Linear Discriminant Analysis in R*	*Best Subset Selection in R*	*Clustering Methods- K-Means Clustering*
	SLO-2	*Indexing data*	*Non-linear Transformations of the Predictors in R*	*Quadratic Discriminant Analysis in R*	*Forward and Backward Stepwise Selection in R*	*Hierarchical Clustering*
S-9	SLO-1	*Reading data*	*Qualitative Predictors in R*	*K-Nearest Neighbors in R*	*Choosing Among Models Using the Validation Set Approach and Cross-Validation in R*	*K-Means Clustering in R*
	SLO-2	*Writing data*	*Writing Functions for linear regression in R*	*An Application to Caravan Insurance Data in R*	*Ridge Regression and the Lasso in R*	*Hierarchical Clustering in R*

Learning Resources	*1. G James, D. Witten, T Hastie, and R. Tibshirani, An Introduction to Statistical Learning: with Applications in R, Springer, 2013* *2. Chambers, John, Software for Data Analysis Programming with R, Springer, 2008* *3. Trevor Hastie Robert Tibshirani Jerome Friedman,The Elements of Statistical Learning, Data Mining, Inference, and Prediction (2nd Edn.), Springer, 2014* *4. Mark Gardener,Beginning R: The Statistical Programming Language, Wiley, 2013* *5. Upadhyaya and A. Upadhyaya, Material Science and Engineering, Anshan Publications, 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	*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
1.Venkatesh K. Pappakrishnan, Ph.D. *Data scientist | Physicist, Santa Clara, California*	*1. Dr. J. Prakash, MIT, Chennai, prakaiit@rediffmail.com*	*1. Dr.V.Kavitha, SRMIST*
2. Prakash V, *Technical Lead at Bridgeline Digital Inc* *Greater Boston Area*	2.Dr.Latha Karthigaa, PhD, Innovation Research Assistant, The University of Auckland	*2. Dr.Alice Nithya, SRMIST*

Course Code	18CSO107T	Course Name	IOS DEVELOPMENT	Course Category	O	Open Elective	L	T	P	C
							3	0	0	3

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning		
		1	2	3
		LevelofThinking (Bloom)	ExpectedProficiency (%)	ExpectedAttainment(%)
CLR-1 :	Understand the basics of ios device and platform			
CLR-2 :	Understand the basic building blocks of ios programming required for App development			
CLR-3 :	Understand Data storage mechanism in ios			
CLR-4 :	Understand advanced application concepts like animations, webservices,etc			
CLR-5 :	Develop and publish ios application in to ios market			
CLR-6 :	understanding enterprise scale requirements of mobile application			

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
		LevelofThinking (Bloom)	ExpectedProficiency (%)	ExpectedAttainment(%)	EngineeringKnowledge	ProblemAnalysis	Design&Development	Analysis,Design, Research	ModernTool Usage	Society&Culture	Environment& Sustainability	Ethics	Individual & TeamWork	Communication	ProjectMgt.&Finance	LifeLongLearning	PSO-1	PSO-2	PSO– 3
CLO-1 :	Acquire the knowledge of ios device and platform	2	80	85	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-2 :	Acquire the knowledge on ios programming for App Development	2	75	80	H	H	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-3 :	Apply the concepts used for data storage in ios	2	85	80	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-4 :	Apply the animation and webservice concepts in the App	2	80	75	H	H	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-5 :	Understand the basic idea to publish ios application into ios market	2	75	85	H	-	-	H	-	-	-	-	-	-	-	-	-	-	-
CLO-6 :	Understand the needs of enterprise to develop App	2	80	85	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Top Mobile OS in Market	The Swift Language-Types	Programmatic views-anchors,Margins	Stack Views	Webservices
	SLO-2	Difference between IOS and Android	Literals and subscripting, Initializers, Properties, Instance methods	Programmatic controls	Nested stack views	
S-2	SLO-1	IOS Architecture	Optionals,Subscripting dictionaries, Loops and String Interpolation	Localization	Segues	JSON Data
	SLO-2		Enumerations			
S-3	SLO-1	History of IOS	Views-Basics	Internalization	UINavigation Controller	Collection views
	SLO-2		Frames, Customizing the labels		Dismissing the keyboard	
S-4	SLO-1	Requirements	The auto Layout System	Controlling Animations	Even handling basics	Extensions
	SLO-2		Adding Constraints	Completion,constraints		
S-5	SLO-1 SLO-2	Versions	Text Input- Editing,Keyboard attributes	Timing functions	Camera	Image caching
S-6	SLO-1	Framework -MVC Design Pattern	Dismissing the keyboard	Debugging	Saving,Loading and Application States	Core Data
	SLO-2		Number formatters			
S-7	SLO-1	Application Life Cycle	Delegation	UITableView and Controller	Loading files, Error handling	Fetch requests and predicates
	SLO-2		Conforming to a protocol			
S-8	SLO-1	Features	View controllers	Editing UITableview	Size class	Core Data Relationships
	SLO-2		UITabBarController			
S-9	SLO-1	A simple IOS Application	Appearing and accessing views	Subclassing UITableViewcell	Touch Events and UIResponder	Accessibility
	SLO-2					

Learning Resources	1. *ChristianKeur,AaronHillegass,iosprogramming:TheBigNerdRanchGuide,6th ed.,Pearson,2016.* 2. *Jon Hoffman, Mastering Swift,4th ed.,Packt Publishing Ltd.,2017.*	3. *Fahim Farook, Matthijs Hollemans, ios Apprentice,7th ed.,Razeware LLC,2018.* 4. *Michael Grant, ios Navigation101,2019.*

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 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
1. Mr.K.Mahendran, Founder, Dreams Technologies, Chennai.	*1.*	*1. Dr.D.Rajeswari, SRMIST*
2.	*2.*	*2. Mr.K.Navin, SRMIST*

Course Code	18CSP101L	Course Name	Industrial Training I (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 exposed to during the duration of training		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	Provide an exposure to the students on the practical application of theoretical concepts in an industry or research institute

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:
CLO-1 :	Gain confidence to carry out supervisory, managerial, and design roles in an industrial context.

Learning Assessment			
Continuous Learning Assessment	Assessment tool	Final review	
	Weightage	Training Report	Presentation *
		75%	25%

*Student has to be present for the presentation for assessment. Otherwise it will be treated as non-appearance for the examination with final grade as 'Ab'

Course Code	18CSP102L	Course Name	Seminar (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 applicable		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	Identify an area of interest within the program or a related one (multidisciplinary), carry out a literature survey on it, gain understanding and present the same before an audience.

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:
CLO-1 :	Carry out a self-study of an area of interest and communicate the same to others with clarity.

Learning Assessment			
Continuous Learning Assessment	Assessment tool	Presentation	
	Weightage	Presentation material	Presentation skills / ability to answer questions / understanding of the topic*
		60%	40%

*Student has to be present for the presentation for assessment. Otherwise it will be treated as non-appearance for the examination with final grade as 'Ab'

Course Code	18CSP103L	Course Name	Project Phase-I / Internship (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 exposed to during the duration of internship		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	Provide an exposure to the students on the practical application of theoretical concepts in an industry or research institute and also to gain hands on experience in the context of design, production and maintenance

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:
CLO-1 :	Gain confidence to carry out supervisory, managerial, and design roles in an industrial context or research environment

Learning Assessment			
Continuous Learning Assessment	Assessment tool	Final review	
	Weightage	Training Report	Presentation*
		75%	25%

*Student has to be present for the presentation for assessment. Otherwise it will be treated as non-appearance for the examination with final grade as 'Ab'

Course Code	18CSP104L	Course Name	Project (Phase-II) / Semester Internship (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:
CLR-1 :	To prepare the student to gain major design and or research experience as applicable to the profession
CLR-2 :	Apply knowledge and skills acquired through earlier course work in the chosen project
CLR-3 :	Make conversant with the codes, standards , application software and equipment
CLR-4 :	Carry out the projects within multiple design constraints
CLR-5 :	Incorporate multidisciplinary components
CLR-6:	Acquire the skills of comprehensive report writing

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:
CLO-1 :	Design a system / process or gain research insight into a defined problem as would be encountered in engineering practice taking into consideration its impacton global, economic, environmental and social context.

Learning Assessment					
Continuous Learning Assessment	Assessment tool	Review I	Review II	Review III	Total
	Weightage	5%	20%	25%	50%
Final Evaluation	Assessment tool	Project Report	Viva Voce *		Total
	Weightage	20%	30%		50%

*Student has to be present for the viva voce for assessment. Otherwise it will be treated as non-appearance for the examination with final grade as 'Ab'

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 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 :	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	
1. Ms. Sudha Mahadevan, Career Launcher, sudha.m@careerlauncher.com	*1. Mr. Nishith Sinha, dueNorth India Academics LLP, nsinha.alexander@gmail.com*	***1. Dr. T. Mythili, SRMIST***	***2. Mrs. B. Revathi, SRMIST***
2. Mr Ajay Zenner, Career Launcher, ajay.z@careerlauncher.com	*2. Dr.Dinesh Khattar, Delhi University, dinesh.khattar31@gmail.com*	*3. Mr. P. Priyanand, SRMIST*	*4. Mrs. M. Kavitha,, 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:*

		Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
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			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 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. Durgadas Basu, 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		
1. Dr. Usha Kodandaraman, ABK AOTS, Chenna . drushak@gmail.com	***1 .Dr. S. P.Dhanavel, IITM, Chennai, dhanavelsp@iitm@ac.in***	***1. Dr. K. Anbazhagan, SRMIST***	***3. Dr.Sukanya Saha, SRMIST***	***5. S. Ramya, SRMIST***
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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:*

		Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
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			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 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	-	-	-

		Physical Development	Emotional Development	Intellectual Development	Social Development	Spiritual Development
Duration (hour)		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
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. ***Sadhguru Jaggi Vasudev, Inner Engineering – A yogi's guide to joy, 2016***	6. ***Vivekananda Kenthria Prkasan Trust, Yogam, 2006***
	2. ***Shri Shri Ravi Shankar, The Art of stress-free Living, 2011***	7. ***Swami Chetanananda, Meditation and Its Methods According to Swami Vivekananda, Jan 2001***
	3. ***Swami Ramdev Ji Yog Its Philosophy and Practice, 2008***	8. ***Dr.Lakshminarain Sharma, Yoga for the cure of Common Diseases, Mar 2016***
	4. ***Yogiraj Vethathiri Maharishi, Yoga for Modern Age, Tenth edition, Vethathiri Publications, 2007***	9. ***Swami Satyananda Saraswati, Asana Pranayama Mudra Bandha, Bihar School of Yoga, 1993***
	5. ***Yogiraj Vethathiri Maharishi, Simplified Physical Exercises, Forty Second edition, Jan-2014***	10. ***Dr. Asana Andiappan, Thirumoolar's Astanga 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	-	*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. 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. Jahira Parveen 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:	1	2	3	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 :	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	-	-	-

		Visions for Youth	Youth and Education	Youth and Society	Youth as Professionals	Youth in Pluralistic Society
Duration (hour)		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
	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***