B.Tech. in Computer Science and Engineering
with Specialization in Computer Networking

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 skills to design and maintain computer and communication systems*
PEO - 6	*Graduates will have the ability to develop tools incorporating the skills acquired in computer networking and its related domains.*

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

	Mission Stmt. - 1	Mission Stmt. - 2	Mission Stmt. - 3	Mission Stmt. - 4	Mission Stmt. - 5
PEO - 1	H	H	H	H	H
PEO - 2	L	H	H	H	H
PEO - 3	H	H	M	L	H
PEO - 4	M	H	M	H	H
PEO - 5	H	H	H	H	H
PEO - 6	H	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	H	H	H	H	H	H
PEO - 4	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
PEO - 5	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
PEO - 6	H	H	H	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 Hardware / Core Computer Science Principles
PSO - 2	Ability to Create Software & Programming
PSO - 3	Ability to Develop systems

Program Structure:B.Tech. in Computer Science and Engineering with Specialization in Computer Networking

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

Course Code	Course Title	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	1	0	2	2
18PDH201T	Employability Skills & Practices	0	0	2	1
Total Learning Credits					**12**

2. Basic Science Courses (B)

Course Code	Course Title	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	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	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	L	T	P	C
18CSE375T	Distributed Computing	3	0	0	3
18CSE356T	Distributed Operating Systems	3	0	0	3
18CSE376T	Optical Networks	3	0	0	3
18CSE377T	Data Centric Networks	3	0	0	3
18CSE378T	Principles of Cloud Computing	3	0	0	3
18CSE379T	Internet of Things	3	0	0	3
18CSE380T	Pervasive Computing	3	0	0	3
18CSE451T	Wireless Sensor Networks	3	0	0	3
18CSE452T	Network Protocols and Programming	3	0	0	3
18CSE453T	Network Routing Algorithms	3	0	0	3
18CSE454T	High Performance Computing	3	0	0	3
18CSE456T	Software Defined Networks	3	0	0	3
18CSE458T	Wireless and Mobile Communication	3	0	0	3
18CSE460T	Network Design and Management	3	0	0	3
18CSE459T	Service Oriented Architecture	3	0	0	3
Total Learning Credits					**18**

6. Open Elective Courses (O)

Course Code	Course Title	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 Tool	3	0	0	3
18CSO107T	IOS Development	3	0	0	3
Total Learning Credits					**12**

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

Course Code	Course Title	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**

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				

Course Code	Course Title	L	T	P	C
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	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 Computer Networking

Course Code	Course Name	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO - 3
		Graduate Attributes												**PSO**		
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	H	M	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	M	L	M	M	L	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	H
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
18CSE375T	Distributed Computing	H	H	H	H	H	M	M	M	H	M	M	H	H	H	H
18CSE356T	Distributed Operating Systems	H	H	H	H	H	L	M	M	H	M	M	H	H	H	H
18CSE376T	Optical Networks	H	H	H	H	H	M	M	M	H	M	H	M	H	H	H
18CSE377T	Data Centric Networks	H	H	H	H	H	M	M	M	H	H	M	H	H	H	H
18CSE378T	Principles of Cloud Computing	H	H	H	H	H	M	M	H	H	H	M	H	H	H	H
18CSE379T	Internet of Things	H	H	H	H	H	M	M	H	H	H	M	H	H	H	H
18CSE380T	Pervasive Computing	H	H	H	H	M	M	M	M	H	H	M	H	H	H	H
18CSE451T	Wireless Sensor Networks	H	H	H	H	M	M	M	M	H	M	L	H	H	H	H
18CSE452T	Network Protocols and Programming	H	H	H	H	M	M	M	M	H	H	L	H	H	H	H
18CSE453T	Network Routing Algorithms	H	H	H	H	M	M	M	M	M	H	L	H	H	H	H
18CSE454T	High Performance Computing	H	H	H	H	H	L	L	M	H	H	L	H	H	H	H
18CSE456T	Software Defined Networks	H	H	H	H	H	M	M	M	M	H	M	H	H	H	H
18CSE458T	Wireless and Mobile Communication	H	H	H	H	M	H	H	H	M	H	M	H	H	H	H
18CSE460T	Network Design and Management	H	H	H	H	M	M	M	M	M	H	L	H	H	H	H
18CSE459T	Service Oriented Architecture	M	H	H	H	H	M	M	M	M	H	M	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	H	H	H	H	H	H	H	H	M	M
18CSP104L	Project (Phase-II) / Semester Internship	H	H	H	H	H	H	H	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 Computer Networking

Semester - I

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

BTECH (CSE)
SPECIALIZATION IN COMPUTER NETWORKING

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

		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 :	Analyze the importance of communication in personal, professional contexts. Identify proper English pronunciation																		
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:

		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 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 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. Usha Kodandaraman, ABK AOTS, Chennai .		1 .Dr. S. P.Dhanavel, IITM, Chennai,	1. Dr. K. Anbazhagan,	3. Dr.Sukanya Saha, SRMIST	5. S. Ramya,

drushak@gmail.com	*dhanavelsp@iitm@ac.in*	*SRMIST*		*SRMIST*
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)																

		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																		

Column headers (vertical):
1 = Level of Thinking (Bloom), 2 = Expected Proficiency (%), 3 = Expected Attainment (%); PLO: 1 = Engineering Knowledge, 2 = Problem Analysis, 3 = Design & Development, 4 = Analysis, Design, 5 = Modern Tool Usage, 6 = Society & Culture, 7 = Environment &, 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

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
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, make interrogative 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 bargain 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 bargain 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 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. 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)																
CLR-1 :	Get to know about France, its culture, heritage and countries speaking French. Build basic abilities to converse in French	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. 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																		
		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
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 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. 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)**

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Get to know about Germany, its culture, heritage. Build basic abilities to converse in German																		
CLR-2 :	Identify and ask for information. Introduce oneself. Build conversational abilities																		
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																		

Column headers: 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

Course Learning Outcomes (CLO): At the end of this course, learners will be able to:

		Bloom	Prof	Att	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
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	H	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, Iinteract 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.	BeispieleSätze 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 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. 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)															
CLR-1 :	Identify the basics of Japan language and the facts of Japan, Make useful expressions and basic conversations.		1	2	3		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
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		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-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 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. 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)

		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	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 :	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-에 가다	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 일과/yesterday'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.쇼핑1shopping1 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 nouns 이/그/저 +것(things)
	SLO-2	grammar point2-은/는		reading/writing		grammar point2- '一' 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 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

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2. Mr. Paul Das, NEC, Chennai	2. Ms. Subashree, VIT, Chennai, subashree@vit.ac.in	2. Ms.Cho Seul Hee, SRMIST

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)															
CLR-1 :	Recapitulate fundamental mathematical concepts and skills		1	2	3		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
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:	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
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, 2014 Wiley'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 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.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)															
CLR-1 :	Acquire knowledge about the fundamental concepts of organization and management				1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
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:				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
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, 13thed., 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 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. 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:

CLR-1 :	create personal awareness and responsibility
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:

		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
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 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
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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																		
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																		

Column headers (vertical): 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

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	L.o.T	E.P%	E.A%	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
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 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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	Prof.S.Balakumar, University of Madras, balakumar@unom.ac.in	Dr.M.Krishnamohan, SRMIST

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)

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

Course Code	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)

		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:	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 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.l 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 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.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	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																				
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																				

Column headings (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

Course Learning Outcomes (CLO): At the end of this course, learners will be able to:

		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 :	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:

		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 :	Describe types of Partial differential equations interpret solutions relate PDE to the respective branches of engineering																		
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:

		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 :	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 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.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. Prof. Ganapathy Subramanian K S, SRMIST	

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)																
					1	2	3		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
CLR-1 :	Apply and evaluating probability using random variables																								
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	8		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 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.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.V. Srinivasan, SRMIST

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.

	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

Course Learning Outcomes (CLO): At the end of this course, learners will be able to:

		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 :	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 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	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. More problems on GCD and LCM.	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.		Problems based on Mathematical Induction	Problems on decoding group codes.	Kruskal's algorithm for minimum spanning trees.
S-12	SLO-1 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.	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

2	Dr.K.C.Sivakumar	IIT, Madras	kcskumar@iitm.ac.in	3	Dr.Nanjundan	Bangalore University	nanzundan@gmail.com

(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:	Learning			Program Learning Outcomes (PLO)																

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

Learning: 1 = Level of Thinking (Bloom), 2 = Expected Proficiency (%), 3 = Expected Attainment (%)

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

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
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
1. Dr. C. N. Ramchand, Saksin Life sciences,ramchand@saksinlife.com	1. Dr. K Subramaniam, IITM Chennai, subbu.iitm.ac.in	Dr. S. Thyagarajan, SRMIST
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			Program Learning Outcomes (PLO)

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
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																		

Column headers (PLO): 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 - I, PSO - II, PSO - III

Learning column headers: Level of Thinking (Bloom), Expected Proficiency (%), Expected Attainment (%)

Course Learning Outcomes (CLO): *At the end of this course, learners will be able to:*

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
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	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	drawing lines, arcs, circles, polygons, create, edit, use layers, extend lines	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	Constructive Solid Geometry, Boolean operations, Creating combination of solids	Design new components as a team	Creation of parametric parts for assembly
	SLO-2	Spirals	ISO, ANSI Std. dimensioning, tolerancing	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					
	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	Building/ Dwelling drawing, Terminology, conventions, sectional plan and side-view of Building/ dwelling, include windows, doors, fixtures,	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		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	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	windows, doors, fixtures, etc.	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	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	windows, doors, fixtures, etc.	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	Design of real time surface-development	Exploded view with assembly annotations
	SLO-2	Shortest distance between two lines	Auxiliary projections	windows, doors, fixtures, etc.	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	Design of real time surface-development	Printing assembly drawings
	SLO-2	shortest distance between point and plane	Oblique pyramidal solids and projections	windows, doors, fixtures, etc.	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 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. 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

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 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																			

Column headers for PLO section: 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

Course Learning Outcomes (CLO): *At the end of this course, learners will be able to:*

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1 :	Analyze basic theory utilized in electrical circuits and its circuits	3	75	70	H	M	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 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.S.Paramasivam, Danfoss, Industries Pvt Ltd., paramsathya@yahoo.com	1.Dr.K.S.Swarup, IIT Madras, ksswarup@iitm.ac.in	1.Dr.K.Vijayakumar, SRMIST
2. Dr. Sricharan Srinivasan, Wipro Technologies, sricharanms@gmail.com	2. Dr. Rajeev Sukumaran, IIT Madras, rajeev@wmail.iitm.ac.in	2.Dr.S.S.Dash, SRMIST

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			Program Learning Outcomes (PLO)															
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

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:

Column headers (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

CLO	Outcome	Lvl	Prof	Attn	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
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. | 8. Gopal T.V, Kumar. T, Murali. G, A first course on workshop practice – Theory, Practice and Work Book, Suma Publications, Chennai, 2005. |
| | | 4. Rajendra Prasad A. & Sarma P.M.M.S., Workshop Practice, Sree Sai Publication, 2002. | |

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	-	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.A.Thirugnanam, SRMIST
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			Program Learning Outcomes (PLO)															

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Think and evolve a logically to construct an algorithm into a flowchart and a pseudocode that can be programmed	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 :	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:																		
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 SLO-2	Lab 1: Algorithm, Flow Chart, Pseudocode	Lab 4: Operators and Expressions	Lab 7: Arrays - Multidimensional	Lab 10: Functions	Lab 13: Structures & Unions
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 SLO-2	Lab 2: Input and Output Statements	Lab 5: Control Statements	Lab 8: Strings	Lab 11: Pointers	Lab 14: Structures & Unions

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:

		Learning			Program Learning Outcomes (PLO)														

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 columns: 1 = Level of Thinking (Bloom), 2 = Expected Proficiency (%), 3 = Expected Attainment (%)

PLO columns: 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	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1 :	Identify the analog and digital components in circuit design	1	80	70	H	H	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-2 :	Analyze the combinational and sequential logic circuits	2	85	75	H	H	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-3 :	Apply gates and flip-flops in circuit design	2	75	70	H	-	H	H	-	-	-	-	-	-	-	-	-	-	-
CLO-4 :	Use simulation package and realize	2	85	80	H	H	H	H	H	-	-	-	-	-	-	H	-	-	-
CLO-5 :	Apply HDL code and synthesize	2	85	75	H	-	H	H	H	-	-	-	-	-	-	-	-	-	-
CLO-6 :	Build the circuits in bread board and demonstrate and FGPA	3	80	70	-	-	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 SLO-2	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
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 SLO-2	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

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 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.**Devi Jayaraman , Virtusa, devji@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:
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

Learning

1	2	3
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

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3																	
CLO-1 :	Apply the knowledge of communication	2	80	70	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-2 :	Identify and design the network topologies	3	85	75	H	-	H	-	-	-	-	-	-	-	-	-	M	-	-
CLO-3 :	Design the network using addressing schemes	3	75	70	H	H	-	-	-	-	-	-	-	-	-	-	M	-	M
CLO-4 :	Identify and correct the errors in transmission	1	85	80	H	H	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-5 :	Identify the guided and unguided transmission media	1	85	75	H	-	-	H	-	-	-	-	-	-	-	-	-	-	-
CLO-6 :	Design and implement the various Routing Protocols	3	80	70	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:	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 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
1. Dr. Nagaveer, CEO, Campus Corporate Connect,nagaveer@campuscorporateconnect.com	1. Dr. Srinivasa Rao Bakshi, IITM, Chennai, sbakshi@iitm.ac.in	1. Mr. K. Venkatesh, SRMIST
2. Dr. Sricharan Srinivasan, Wipro Technologies, sricharanms@gmail.com	2. Dr. Ramesh Babu, N , nrbabu@iitm.ac.in	2. Dr.Subalalitha C.N, SRMIST
	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

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

Program Learning Outcomes (PLO) 1-15: 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

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1 :	Identify the class and build domain model	3	80	70	H	H	M	-	-	-	-	-	H	H	-	-	M	H	H
CLO-2 :	Construct programs using method overloading and operator overloading	3	85	75	H	H	H	H	H	-	M	-	H	H	-	-	M	H	H
CLO-3 :	Create programs using inline, friend and virtual functions, construct programs using standard templates	3	75	70	H	H	M	H	H	-	M	-	H	H	-	-	M	H	H
CLO-4 :	Construct programs using exceptional handling and collections	3	85	80	H	H	H	-	-	-	-	-	H	M	-	-	M	H	H
CLO-5 :	Create UML component diagram and deployment diagram	3	85	75	H	M	M	M	M	M	M	-	H	H	-	M	M	H	H
CLO-6 :	Create programs using object oriented approach and design methodologies	3	80	70	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 SLO-2	Lab 1: I/O operations	Lab 4: Constructor and Method overloading	Lab 7: Inheritance and its types	Lab 10: Templates	Lab 13: STL Containers
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 SLO-2	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
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 SLO-2	*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*

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

Learning

	1	2	3
	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

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking	Expected Proficiency	Expected Attainment	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1 :	Identify the computer hardware and how software interacts with computer hardware	2	80	70	H	H	-	-	-	-	-	-	M	L	-	M	-	-	-
CLO-2 :	Apply Boolean algebra as related to designing computer logic, through simple combinational and sequential logic circuits	3	85	75	H	H	H	-	H	-	-	-	M	L	-	M	-	-	-
CLO-3 :	Analyze the detailed operation of Basic Processing units and the performance of Pipelining	2	75	70	H	H	H	H	-	-	-	-	M	L	-	M	-	-	-
CLO-4 :	Analyze concepts of parallelism and multi-core processors.	3	85	80	H	-	-	H	-	-	-	-	M	L	-	M	-	-	-
CLO-5 :	Identify the memory technologies, input-output systems and evaluate the performance of memory system	3	85	75	H	-	H	H	-	-	-	-	M	L	-	M	-	-	-
CLO-6 :	Identify the computer hardware, software and its interactions	3	85	75	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 Addition and Subtraction of 8-bit number	Lab-7: Design of Half Adder Design of Full Adder	Lab-10: Study of Array Multiplier Design of Array Multiplier	Lab-13: Study of Carry Save Multiplication Program to carry out Carry Save Multiplication
	SLO-2	Processing and Memory units				
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*	*Lab-8: Study of Ripple Carry Adder*	*Lab-11: Study of Booth Algorithm*	*Lab-14: Understanding Processing unit*
	SLO-2	*Assembling of System Components*	*Subtraction of 16-bit number*	*Design of Ripple Carry Adder*		*Design of primitive processing unit*
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*	*Lab-9: Study of Carry Look-ahead Adder*	*Lab-12: Program to carry out Booth Algorithm*	*Lab-15: Understanding Pipeline concepts*
	SLO-2	*Disassembling of System Components*	*Factorial of a given number*	*Design of Carry Look-ahead Adder*		*Design of basic pipeline.*

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 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. 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:

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:

		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	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
	SLO-2					

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 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
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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:

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:

		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
CLO-1 :	Identify the need of an Operating system	1	80	70	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	1	85	75	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	1	75	70	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	2	85	80	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	2	85	75	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	3	80	70	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 SLO-2	LAB 1 : Understanding the booting process of Linux	LAB4 : System admin commands – Basics	LAB7: Shell Programs – Basic level	LAB10 : Overlay concept	LAB13:Process synchronization
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 / SLO-2	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
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 / SLO-2	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

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 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 %		-	

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

Learning

Program Learning Outcomes (PLO)

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom) 1	Expected Proficiency (%) 2	Expected Attainment (%) 3	Engineering Knowledge 1	Problem Analysis 2	Design & Development 3	Analysis, Design, Research 4	Modern Tool Usage 5	Society & Culture 6	Environment & Sustainability 7	Ethics 8	Individual & Team Work 9	Communication 10	Project Mgt. & Finance 11	Life Long Learning 12	PSO - 1 13	PSO - 2 14	PSO - 3 15
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** **SLO-2**	*Lab 3: Object Oriented Programming*	*Lab 6: Imperative Programming*	*Lab 9: Functional Programming*	*Lab 12: Network Programming*	*Lab 15: GUI Programming*

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
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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

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

Learning columns: Level of Thinking (Bloom), Expected Proficiency (%), Expected Attainment (%)

PLO columns: 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

Course Learning Outcomes (CLO): At the end of this course, learners will be able to:

CLO	Description	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
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 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.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

	Learning			Program Learning Outcomes (PLO)															
	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Course Learning Outcomes (CLO): At the end of this course, learners will be able to:

		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 & 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	*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*
	SLO-2					
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	*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*
	SLO-2					

Learning Resources	1. BehrouzA.Forouzan,"DataCommunicationsandNetworking"5thedition,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
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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			Program Learning Outcomes (PLO)															
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Understand the fundamentals of Database Management Systems, Architecture and Languages				Engineering Knowledge	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
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:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment(%)																
CLO-1 :	Acquire the knowledge on DBMS Architecture and Languages	3	80	70	H	M	L	L	-	-	-	-	L	L	H	H	-	-	-
CLO-2 :	Apply the fundamentals of data models to model an application's data requirements using conceptual modeling tools like ER diagrams	3	85	75	H	H	H	H	H	-	-	-	H	H	H	H	-	-	-
CLO-3 :	Apply the method to convert the ER model to a database schemas based on the conceptual relational model	3	75	70	H	H	H	H	H	-	-	-	H	H	H	H	-	-	-
CLO-4 :	Apply the knowledge to create, store and retrieve data using Structure Query Language (SQL) and PL/SQL	3	85	80	H	H	H	H	H	-	-	-	H	H	H	H	-	-	-
CLO-5 :	Apply the knowledge to improve database design using various normalization criteria and optimize queries	3	85	75	H	H	L	M	L	-	-	-	M	M	M	L	-	-	-
CLO-6 :	Appreciate the fundamental concepts of transaction processing- concurrency control techniques and recovery procedures.	3	85	75	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	Lab 2: SQL Data Manipulation Language Commands	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
	SLO-2	*Identification of project Modules and functionality				
S-11	SLO-1	Degrees of Data Abstraction	ER Diagram Issues	PL/SQL Concepts- Cursors	BCNF	Locking mechanism, solution to concurrency related problems
	SLO-2		Weak Entity			
S-12	SLO-1	Database Users and DBA	Relational Model	Stored Procedure, Functions Triggers and Exceptional Handling	Multi- valued dependency,	Deadlock
	SLO-2				4NF	
S-13	SLO-1	Database Languages	Conversion of ER to Relational Table	Query Processing	Join dependency and 5NF	two-phase locking protocol, Isolation, Intent locking
	SLO-2					
S 14-15	SLO-1	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
	SLO-2					

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,2ded.,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:	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 :	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:	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:*

		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 :	*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:*

		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	H	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 Intelliegent Systems, 1st ed., PHI learning,2015 2. DeepakKemhani,FirstcourseinArtificilaIntelligence,McGrawHillPvtLtd,2013 3. Stuart J. Russell, Peter Norwig , Artificial Intelligence –A Modern approach, 3rd Pearson Education, 2016	4. PrateekJoshi,ArtificialIntelligencewithPhython,1^{st}ed.,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	18CSE375T	Course Name	DISTRIBUTED COMPUTING		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 / **Program Learning Outcomes (PLO)**

					1	2	3		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

CLR-1 : Layout foundations of Distributed Systems.
CLR-2 : Get familiar with the idea of middleware and related issues
CLR-3 : Understand in detail the system level and support required for distributed system
CLR-4 : Understand the issues involved in studying data and cryptographic algorithms
CLR-5 : Expose to the concept of design and implementation of distributed file systems

Column headers (vertical): 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 & TeamWork, Communication, ProjectMgt.&Finance, LifeLongLearning, PSO-1, PSO-2, PSO-3

Course Learning Outcomes (CLO): At the end of this course, learners will be able to:

CLO		LoT	EP	EA	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1 :	Fundamentals of Distributed System Concepts and access System	2	80	85	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-2 :	An ability to familiar with various architecture models and Distributed File access techniques	2	75	80	H	H	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-3 :	An ability to understand the security aspects of distributed system	2	85	80	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
					H	H	-	-	-	-	-	-	-	-	-	-	-	-	-
					H	-	-	H	-	-	-	-	-	-	-	-	-	-	-
					H	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Introduction to Distributed Systems	Distributed Computing Model	Remote Procedure Call	Introduction of Security systems in distributed system	Distributed File Systems –Introduction
	SLO-2				Potential attacks and threats on computer systems	
S-2	SLO-1	Characterization of Distributed Systems	Workstation model	Remote method invocation	Cryptography	File Service Architecture
	SLO-2	Examples of Distributed Systems	Workstation server model		Symmetric cryptosystem algorithm –DES	
S-3	SLO-1	Architecture of Distributed Systems	Process pool model	Client server model basics concepts	Asymmetric cryptosystems	File Models
	SLO-2	Shared and Distributed Memory Architechture	Comparison of Distributed computing model	Client server addressing		
S-4	SLO-1	Focus on resource sharing the web	Interprocess communication	Client server implementations	Secure Channels-Authentication	DFS Design
	SLO-2				Message Integrity and confidentiality	
S-5	SLO-1	Challenges in Distributed Systems	External data representation and multicast communication	Client Server Architecture	Access control	DFS implementation
	SLO-2					
S-6	SLO-1	Design issues in Distributed systems	API for Internet protocol	Group communication publish and subscribe systems	Security Management	File catching in DFS
	SLO-2				Issues in key distribution	
S-7	SLO-1	Networking and Internetworking basic introduction Types of Network	Network Virtivalization and overlay networks	Shared memory approach	Secure group management	Implementation in DFS
	SLO-2			Distributed objects	Authorization management	

S-8	SLO-1	Network Principles	*Case Study : interprocess communication in UNIX*	*Case study : java RMI*	*Case study - Kerberos*	*Case study – Sun network File systems*
	SLO-2					
S-9	SLO-1	Internet protocol	*Case study - MPI*	*Case Study - CORBA*	*Case study - Epayment*	*Case study - Google File systems*
	SLO-2					

Learning Resources	*i.GeorgeCoulouris,JeanDollimore,TimKindberg,"DistributedSystemsConceptsandDesign"Fifth edition – 2011- AddisonWesley* *ii. SunitaMahajan,SeemaShah,"DistributedComputing"SecoundEdition–OxfordPress*	*iii. Liu M.L., "Distributed Computing, Principles and Applications", Pearson and education,2004.* *iv. Tanenbaum A.S., Van Steen M., " Distributed Systems: Principles and Paradigms" , PearsonEducation,2007.*

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	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. M.Ravichandran,CEO, Terafast	1.. **Dr.K.Vivekanadan, Professor,PEC,k.vivekanandan@pec.edu**	*1. Dr. A.Murugan , SRMIST*
2.		*2. Dr. G.Maragatham,SRMIST* *3. Ms. S. Aruna ,SRMIST*

Course Code	18CSE356T	Course Name	DISTRIBUTED OPERATING SYSTEMS	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 :	To recognize the essential concepts of distributed system.
CLR-2 :	To comprehend about the communication that takes place in Distributed systems
CLR-3 :	To realize the necessity of synchronization, consistency and Fault tolerance in a Distributed System.
CLR-4 :	To value the Process management, File systems, Shared memory
CLR-5 :	To acquire apparent scheme regarding distributed object-oriented based systems

Learning / **Program Learning Outcomes (PLO)**

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO – 1	PSO – 2	PSO – 3
CLO-1 :	Characterize the fundamental hardware and software concepts of distributed systems.	3	80	70	H	M	M	H	H	M	-	-	H	M	-	H	-	-	-
CLO-2 :	Categorize layered protocols and comprehend the communications in distributed systems	3	85	75	H	M	H	M	H	M	-	-	H	M	-	H	-	-	-
CLO-3 :	Implement synchronization of distributed systems using various algorithms.	3	75	70	H	H	H	H	H	M	-	-	H	M	-	H	-	-	-
CLO-4 :	Demonstrate process scheduling and fault tolerance of distributed systems.	3	85	80	H	H	H	H	H	M	-	-	H	M	-	H	-	-	-
CLO-5 :	Evaluate various Distributed Object-Oriented based systems.	3	85	75	H	H	H	M	H	M	-	-	H	M	-	H	-	-	-

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Introduction- Distributed Systems	Fundamentals of Communication systems	Synchronization in Distributed Systems-Fundamentals of Clock Synchronization	Processes and Processors in Distributed Operating Systems - Threads	Distributed Shared memory - Introduction
	SLO-2	Goals of Distributed Systems		Logical clock, Physical clock	Design issues of Threads package	Bus-Based Multiprocessors
	SLO-2				Work Station Model	Switched Multiprocessors
S-2	SLO-1	Hardware Concepts- Bus-based Multiprocessors	Layered Protocols	Algorithms for Clock synchronization	System Model - Introduction	Ring-based Multiprocessors
S-3	SLO-1		ATM networks	Mutual Exclusion-Centralized Algorithm	Using Idle Work Stations	Numa Multiprocessors
	SLO-2	Switched Multiprocessors				Comparison of Shared Memory Systems
S-4	SLO-1	Bus-based Multicomputers	Client Server model - Blocking Primitives	Distributed Algorithm	Processor Pool Model, Hybrid Model	Consistency Models – Strict Consistency, Casual Consistency, PRAM Consistency
	SLO-2		Non-Blocking Primitives	Token Ring Algorithm	Processor Allocation – Allocation Model	Weak Consistency, Release Consistency, Entry Consistency
S-5	SLO-1	Switched Multicomputers	Buffered Primitives	Comparison of all three algorithms	Design issues for processor Allocation Algorithms	Page Based Distributed Shared Memory – Replication, granularity
	SLO-2		Unbuffered Primitives	Importance of Election Algorithm	Example of processor Allocation Algorithms	Finding the Owner,Finding the Copies
S-6	SLO-1	Software Concepts-Network Operating System	Reliable primitives	Bully Algorithm	Scheduling in Distributed Systems	Page Replacement
	SLO-2		Unreliable primitives	Ring Algorithm	Load Balancing and Sharing Approach	Synchronization
S-7	SLO-1	True Distributed Systems	Message passing and its related issues	Atomic Transaction- Introduction	Fault Tolerance-Component Faults	Shared – Variable Distributed Shared memory
	SLO-2			Transaction Model, Concurrency Control	System Failures	Object Based Distributed Shared memory – DOO Architecture
S-8	SLO-1	Multiprocessors Timesharing Systems	Remote Procedure Call and its related issues	Deadlock in Distributed Systems	Synchronous versus Asynchronous Systems	Distributed Object-Oriented Process
	SLO-2			Distributed Deadlock Detection	Fault tolerance Using Active Replication, Primary-backup	Distributed Object-oriented Communication
S-9	SLO-1	Design Issues-Distributed Systems	Case Studies: SUN RPC, DEC RPC	Distributed Deadlock Prevention	Real Time Distributed Systems-Communication	Case Study - Amoeba
	SLO-2				Real Time Scheduling	Mach-OS, Chorus

Learning Resources	1. Andrew S. Tanenbaum, "Distributed Operating Systems "PearsonEducation, 2011. 2. Pradeep K. Sinha "DistributedOperatingSystems Concepts and Design "PHI 2012.	3. Mukesh Singhal, Niranjan G Shivratri "Advanced concepts in Operating Systems ", Mc Graw Hill International 2011. 4. http://www.seas.gwu.edu/~jstanton/courses/cs251/ 5.http://cse.yeditepe.edu.tr/~sbaydere/courses new/cse532/

Learning Assessment

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

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

Course Designers		
Experts from Industry	**Experts from Higher Technical Institutions**	**Internal Experts**
JP Vinjamoori, Director, Pavartha Software Pvt.Ltd, jp@pavarthasoftware.com	Dr. E.Sivasankar,NIT,Trichy	Mrs. S. Aruna, Dr.G. Maragatham, Mrs. A. Jackulin Mahriba, SRMIST

Course Code	18CSE376T	Course Name	OPTICAL NETWORKS		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 :	Study the fundamentals of optical networks
CLR-2 :	Gather knowledge about different types of components
CLR-3 :	Learn single hop and multi hop networks
CLR-4 :	Acquire knowledge about different WDM network design
CLR-5 :	Understand about OADM architecture
CLR-6 :	Gather knowledge about optical TDM and CDMA

Learning

	1	2	3
	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
	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

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1 :	Acquire knowledge about basic fundamentals of optical networks	2	80	85	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-2 :	Understand various classifications of optical components	2	75	80	H	H	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-3 :	Develop the ability to apply optical concepts in single and multihop networks	2	85	80	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-4 :	Gather knowledge about various multiplexing techniques	2	80	75	H	H	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-5 :	Acquire knowledge about OADM concept	2	75	85	H	-	-	H	-	-	-	-	-	-	-	-	-	-	-
CLO-6 :	Apply various techniques to handle spectrum with a different perspective	2	80	85	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Introduction to optical networks	Components :Couplers – Principle of operation	Broadcast optical networks – characteristics of single hop networks	WDM Network Elements :Optical line terminals	Optical TDM Networks
	SLO-2	Telecommunication Network Architecture and services	Conservation of energy	Experimental WDM Systems	optical line amplifiers	Basics of TDM
S-2	SLO-1	Optical Networks- Multiplexing Techniques	Isolators	Other Non – Pretransmission Coordination protocols	Optical Add/Drop Multiplexers	Optical TDM
	SLO-2	Second Generation Optical Networks	Circulators	Pretransmission coordination protocols	OADM Architecture	Optical Sources
S-3	SLO-1	Optical Layer	Multiplexers – Gratings, Diffraction Patterns	Special Case: Linear Bus with Attempt-and-Defer Nodes	Optical crossconnects	Modulation
	SLO-2	Optical packet switching	Bragg and Fiber Gratings	AMTRAC and multichannel probabilistic scheduling	OXC Configurations	multiplexing
S-4	SLO-1	Transmission Basics – wavelengths, Frequencies, and channel spacing	Filters – fabryperot filters	Single- Hop Case study : IBM Rainbow Protocol	WDM Network Design: Cost trade-offs	Transmission of Ultrafast OTDM signal using soliton
	SLO-2	Standards, optical power and loss	Mach-Zehnder Interferometers, Arrayed Waveguide gratings	Model, Analysis	LTD and RWA problems	Demultiplexing
S-5	SLO-1	WDM Networking Evolutions	Optical Amplifiers – Emissions	Multihop Networks: characteristics, topological optimization studies	Light path topology design	Clock Recovery
	SLO-2	WDM Network Constructions	Erbium -Doped fiber amplifiers, Raman Amplifiers and Semiconductor optical amplifiers	Regular structures	Routing and wavelength assignment and conversion	Optical processing
S-6	SLO-1	Optical Fiber- Transmission	Transmitters – Lasers, Light emitting diodes,tunable lasers	Near- Optimal Node Placement	Dimensioning Wavelength	Optical TDM network Architectures
	SLO-2	Single mode vs Multimode fiber	Direct and external modulation, pump sources	Shared- channel multihop systems	Routing Networks	Optical TDM proposals

S-7	SLO-1	Attenuation in Fiber	Detectors – photo detectors	Multihop case study – GEMNET	Statistical Dimensioning Models : First passage model	Optical CDMA Networks:
	SLO-2	Dispersion in Fiber	Front end amplifiers	GEMNET Architecture and properties	Blocking model	Basics of CDMA
S-8	SLO-1	Non Linear Effects – self phase modulation	Switches – large optical switches, optical switch technologies	Channel sharing	Maximum load dimensioning model : offline lightpath requests	Spread spectrum
	SLO-2	Cross phase modulation	Large electronic switches	Multicasting	Online RWA in rings	Code sequences
S-9	SLO-1	Solitons	Wavelength converters – optoelectronic Approach, optical gating	Shared – channel Multihop GEMNET	Access Networks : Network Architecture overview	CDMA Example
	SLO-2	Dispersion- Managed Solitons	Interferometric techniques, wave mixing	Performance Evaluation	Enhanced HFC	Optical CDMA

Learning Resources	1. Rajiv Ramaswami, Kumar N. Sivarajan, Galen H. Sasaki, Optical Networks A Practical Perspective, thirdEdition 2. OpticalSwitchingNetworks:Mayer&Martin,CambridgeUniversityPress,2008.	3. U.Black,"OpticalNetworks:ThirdGenerationTransportSystems"/PearsonEducations 4. R.Ramaswami,&K.N.Sivarajan,"OpticalNetworksaPracticalperspective",MorganKaufmann Publishers, 3rdEd.

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. Madhumaran, NOKIA digital and Networking, Technical Lead, p.madhumaran@nokia.com	1. Prof. NilanjanDey, Techno India College of Technology , Kolkata, nilanjan.dey@tict.edu.in	1. Prof. V.Sivakumar, SRMIST
2. Mr. N.Ramkumar, TCS Assistant Consultant, ram.kumarn@tcs.com	2. Prof. E.Rajesh, GalgotiasUniversity,Delhi, rajesh.e@galgotiasuniversity.edu.in	2. Prof. P.Visalakshi, SRMIST

Course Code	18CSE377T	Course Name	DATA CENTRIC NETWORKS	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 :	Critically discuss data center networking technologies
CLR-2 :	Evaluate key concepts in modern Layer 2 & Layer 3 data center networks
CLR-3 :	Concepts related to networking technologies in modern data centers.
CLR-4 :	Design, build and configure complex routed and switched networks
CLR-5 :	Expose to implementing the networking solutions in a virtualized environment

Course Learning Outcomes (CLO): At the end of this course, learners will be able to:

		Learning 1 (LevelofThinking Bloom)	Learning 2 (ExpectedProficiency %)	Learning 3 (ExpectedAttainment %)	PLO 1 Engineering Knowledge	PLO 2 Problem Analysis	PLO 3 Design&Development	PLO 4 Analysis,Design	PLO 5 ModernTool Usage	PLO 6 Society&Culture	PLO 7 Environment&	PLO 8 Ethics	PLO 9 Individual & TeamWork	PLO 10 Communication	PLO 11 ProjectMgt.&Finance	PLO 12 LifeLongLearning	PLO 13 PSO-1	PLO 14 PSO-2	PLO 15 PSO-3
CLO-1 :	apply networking technologies in data centers	1	90	85	L	-	H	M	-	-	-	-	-	-	-	H	L	-	-
CLO-2 :	design modern data centers which incorporate all dynamic routing protocols.	3	85	80	M	M	H	H	H	-	-	-	-	-	-	H	M	H	-
CLO-3 :	design layer 2 and layer 3 protocols.	3	85	80	M	H	H	H	H	-	-	-	-	-	-	H	M	H	-
CLO-4 :	design and configure the data centers	3	80	75	M	H	H	H	H	-	-	-	-	-	-	H	H	H	-
CLO-5 :	implement various network solutions for data centers	3	80	75	H	H	H	H	H	H	-	M	-	-	-	H	M	H	H

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Data centric networking from different perspectives	Introduction to data center architectures	Introduction to server Architectures	Introduction to Layer 2 Networks	Introduction to Layer 3 Networks
	SLO-2					
S-2	SLO-1	Content-Centric Networking (CCN)	Top of rack (TOR)network connectivity	Clustering in server architectures	IEEE 802.3ba standards	Layer 3 Data Center technologies
	SLO-2					
S-3	SLO-1	Content Distribution Networks (CDN)	End of rack(EOR) network connectivity	scaling in server architectures	40 Gbps and 100 Gbps Ethernet	Locator Identifier Separation Protocol (LISP)
	SLO-2					
S 4-5	SLO-1	Requirements for modern data centers	Solutions that reduce cabling in architecture	Optimization in server architectures	IEEE 802.1D Spanning Tree Protocol (STP)	Layer 3 Multicasting
	SLO-2					
S-6	SLO-1	Design for flexibility	Solutions that reduce power in architecture	Stand-alone blades	RSTP protocol	Protocols; IPv4, IPv6
	SLO-2					
S-7	SLO-1	Design for scalability	TIA/EIA-942. Structured cabling standards	Redundant Layer 2 and Layer 3 designs	PVST protocol	Protocols; MPLS, OSPF
	SLO-2	Design for environmental control			MSTP protocol	
S-8	SLO-1	Design for electrical power	Cable management	Limitation of traditional server deployments	TRILL protocols	Protocols; IS-IS, BGP
	SLO-2	Design for Backup	Bandwidth requirements		IEEE 802.1Qbg Edge Virtual Bridging	
S-9	SLO-1	Flooring in data centers	I/O connectivity	Case study	Fiber Channel over Ethernet (FCoE) vs Internet	OTV& VPLS layer 2 extension
	SLO-2					

Learning Resources	1. MouricioArregoces,"Data Centre Fundamentals",CiscoPress,2003
	2. SilvanoGai,Claudio DeSanti,"I/O Consolidation in the Data Center" Cisco Press;1 edition [ISBN:9781587058882].2009.
	3. KevinCorbin,Ron Fuller,DavidJansen,"NX-OSand CiscoNexus Switching:Next-Generation Data Center Architectures"CiscoPress;1 edition [ISBN:9781587058929],2010.
	4. Silvano Gai,Tommi Salli,RogerAndersson,"Cisco Unified Computing System" CiscoPress;1edition,[ISBN:9781587141935],2010.
	5. NashDarukhanawalla,Patrice Bellagamba,"Interconnecting Data Centers Using VPLS"CiscoPress;1edition,[ISBN:9781587059926],2009.
	6. RobertW.Kembel,Roger Cummings(Introduction),"The Fibre Channel Consultant" Northwest Learning Assoc;3rdedition,[ISBN:0931836840],1998.
	7. Robert W Kembal"FiberChannelSwitchedFabric"Northwest Learning Associates,inc.[ISBN:0931836719],2009.
	8. JohnL.Hufferd,"ISCSI",Addison-WesleyBoston[ISBN:978-0201784190],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	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.M.S.Sricharan/Wipro Technologies		Dr. B.Amutha, Professor and Head, Department of CSE, SRM IST
		Dr. G.Vadivu, Professor and Head, Department of IT, SRM IST

Course Code	18CSE378T	Course Name	PRINCIPLES OF CLOUD COMPUTING	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 fundamental ideas behind Cloud Computing, the evolution of the paradigm, its applicability; benefits, as well as current and future challenges
CLR-2 :	Learn cloud enabling technologies and get exposure to advanced clouds
CLR-3 :	Explore cloud storage technologies and relevant distributed file systems, NoSQL databases and object storage;
CLR-4 :	Understand the cloud security threats and protective mechanism for cloud computing
CLR-5 :	Participate in team-based peer reviews to analyze the security development life cycle and mitigate risks and vulnerabilities

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

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1 :	Explain terms used in secured software development and life cycle process	3	80	70	H	H	H	H	M	-	-	-	L	L	-	H	-	-	-
CLO-2 :	Apply fundamental concepts in cloud infrastructures to understand the cloud system, network and virtualization and outline their role in enabling the cloud computing system model.	3	85	75	M	H	L	M	H	M	-	-	M	L	-	H	-	-	-
CLO-3 :	Illustrate the fundamental concepts of cloud storage and demonstrate their use in storage systems such as Amazon S3 and HDFS	3	75	70	M	H	M	M	H	-	-	-	M	L	-	H	-	-	-
CLO-4 :	Evaluate the security issues related to cloud computing and handle the security threats and construct different cloud delivery design models.	3	85	80	M	H	L	H	M	-	-	-	M	L	-	H	-	-	-
CLO-5 :	Analyze various cloud programming models and apply them to solve problems on the cloud.	3	85	75	H	H	M	H	H	M	-	-	M	M	-	H	-	-	-

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Introduction to Cloud Computing	Cloud enabling technologies- Broadband networks and Internet architecture	Introduction to Cloud Data Storage, The evaluation of storage technology	Fundamental Cloud Security	Cloud Application Development and Architectural Styles
S-1	SLO-2	Evolution of cloud computing			Basic Terms and Concepts	
S-2	SLO-1	Network-Centric Computing	Data Center Technology	Storage Models	Threat Agents, Cloud Security Threats	MapReduce Programming Model
S-2	SLO-2	Network-Centric Content				
S-3	SLO-1	Origin of Cloud Computing, Basic Concepts and Terminology	Web Technology	File Systems and databases	Cloud Security Mechanisms	Case Study: the GrepTheWeb Application
S-3	SLO-2		Multitenant Technology			
S-4	SLO-1	Goals and Benefits	Service Technology Virtualization Technology	Distributed File Systems Google File System	Encryption Hashing	Hadoop: Yarn and Tez
S-4	SLO-2	Risks and Challenges, Roles and Boundaries, Cloud Characteristics				
S-5	SLO-1	Cloud Service Models	Virtual Machines	HDFS	Digital Signature, Public Key Infrastructure	SQL on Hadoop: Pig, Hive, and Impala
S-5	SLO-2	Cloud Deployment Models		NoSQL Databases		
S-6	SLO-1	Cloud Service Providers and the Cloud Ecosystem	Full Virtualization and Para-virtualization	Cloud Databases (HBase, MongoDB, Cassandra, DynamoDB)	Identity and Access Management, Single Sign-On: Kerberos authentication	Current Cloud Applications and New Opportunities
S-6	SLO-2					
S-7	SLO-1	Amazon Web Services(AWS), Google Clouds, Microsoft Azure Cloud	Hardware Support for Virtualization	Cloud Object Storage (Amazon S3, OpenStack Swift, Ceph)	One-time password, Basic cloud data security mechanisms	Design approaches with Case Study
S-7	SLO-2					
S-8	SLO-1	SLA Management in Cloud Computing: A Service Providers Perspective	Kernel-Based Virtual Machine, Hypervisors	Data Storage for Online Transaction Processing Systems	Virtual Machine Security, Security of Virtualization, A Trusted Hypervisor	Design methodology for IaaS Service Model
S-8	SLO-2					
S-9	SLO-1	Case Study on Open Source & Commercial Clouds: Eucalyptus, OpenStack, Aneka	Containers; Docker Containers, Kubernetes	Disk Locality versus Data Locality in Computer Clouds	Mobile Devices and Cloud Security	Google API, AWS EC2 Instances.
S-9	SLO-2					

Learning Resources	1.Dan C. Marinescu," Cloud Computing Theory and Practice", Second Edition Copyright © 2018 Elsevier Inc. All.https://www.sciencedirect.com/book/9780128128107/cloud-computing 2.Rajkumar Buyya, James Broberg, AndrzejGoscinski, Cloud Computing Principles and Paradigms, Wiley Publications, 2017. 3. Thomas Erl, ZaighamMahmood, and RichardoPuttini, "Cloud Computing: Concepts, Technology & Architecture", Prentice Hall/PearsonPTR, Fourth Printing, 2014, ISBN: 978013338752.	4.K. Chandrasekaran, "Essentials of Cloud Computing", Chapman and Hall/CRC Press, 2014, ISBN 9781482205435 5.Arshdeep Bahga, Vijay Madisetti, "Cloud Computing: A Hands-On Approach", University Press, 2016, ISBN-13: 978-0996025508.

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 SuriyadeepanRamamoorthy Research Engineer at Saama Technology Puducherry, Puducherry, India Information Technology and Services	Experts from Higher Technical Institutions Dr.E. Ilavarasan Professor,CSE Pondicherry Engineering college.	Internal Experts 1.Mrs Krishnaveni,SRMIST,KTR-SWE
		2.Dr.S.Ramamooorthy,SRMIST,KTR-CSE
		3.Mr.K. Venkatesh,SRMIST,KTR-IT
		4.Mr. S.VidhyaSagar,SRMIST,Vadapalani campus

Course Code	18CSE379T	Course Name	INTERNET OF THINGS	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 basic concepts of IoT and its possible application areas
- **CLR-2 :** Understand the various IoT architectures along with compute and management stack across layers
- **CLR-3 :** Understand the architecture dissected at physical, communication and Access levels
- **CLR-4 :** Introduce existing toolkits, available platforms, boards, software and laguages for easy development of IoT products
- **CLR-5 :** Understand the various enabling technologies for IoT including Big data analytics, Machine learning, Cloud and Streaming analytics
- **CLR-6 :** Understand the underlying business model for IoT and also acquire skills for DiY (Do it Yourself)

Course Learning Outcomes (CLO): At the end of this course, learners will be able to:

		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 & TeamWork	Communication	ProjectMgt.&Finance	LifeLongLearning	PSO-1	PSO-2	PSO-3
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1 :	Appreciate the omnipotent presence of IoT in all fields across globe	2	80	85	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-2 :	Compare and contrast various architectures and be able to justify the right choice for adoption	2	75	80	H	H	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-3 :	Choose appropriate protocols for various levels/layers based on the requirement in hand	2	85	80	H	M	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-4 :	Implement using the available resources and demonstrate quick to deployment sills wherever applicable	2	80	75	H	H	H	M	-	-	-	-	-	-	-	-	-	-	-
CLO-5 :	Apply the tools and techniques towards integration in relevant areas of IoT product development	2	75	85	H	M	H	M	H	-	-	-	M	-	-	H	-	-	-
CLO-6 :	Showcase DiY approach given any implementable idea to product	2	80	85	H	M	H	H	H	-	-	-	H	-	-	H	-	-	-

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Introduction to IOT	Drivers Behind New Network Architectures	Smart Objects: The "Things" in IoT	Data Analytics for IoT- Overview	Business Models for IoT: Introduction
	SLO-2	What, Where and How of IoT?	Comparing IoT Architectures	Sensors, Actuators, and Smart Objects	IoT Data Analytics Challenges	Business Models
S-2	SLO-1	Data Flow of IoT	The IoT World Forum (IoTWF) Standardized Architecture	Micro-Electro-Mechanical Systems (MEMS)	Relevance of ML and IoT- Overview	Business Model Innovation
	SLO-2	Definition and characteristics of IOT	IT and OT Responsibilities in the IoT Reference Model	Smart Objects,Smart Objects: A Definition	Relevance of Big data and IoT- Overview	Value Creation in IoT
S-3	SLO-1	Architecture of Internet of Things: Physical-Things	A simplified IoT architecture	Trends in Smart Objects	ML and getting Intelligence from Big Data	Laws of Information
	SLO-2	Architecture of Internet of Things: Protocols-an Introduction	The core IoT functional stack	Sensor Networks	Big data analytics tools and techniques for IoT: Overview	Revenue Generation in the Internet of Things
S-4	SLO-1	Architecture of Internet of Things: Logical-Functional Blocks	Layer 1: Things: Sensors Layer	Wireless Sensor Networks (WSNs)	MPP, NoSQL	Exemplary Business Model Scenarios for the Internet of Things
	SLO-2	Architecture of Internet of Things: Logical-Communication Models	Layer 1: Things: Actuators Layer	Communication Protocols for WirelessSensor Networks- a Introduction	Hadoop and YARN	Scenario 1: Product as a Service (PaaS)
S-5	SLO-1	Architecture of Internet of Things: Logical-Communication API	Layer 2: Communications Network Layer: Access, Gateway	Communication Criteria- Introduction	Hadoop Eco system	Scenario 2: Information Service Providers
	SLO-2	IOT enabling technologies	Layer 2: Communications Network Layer: Network, Management	Communication Criteria- Definitions	Apache Kafk, Spark, Storm, Flink,	Scenario 3: End-user Involvement
S-6	SLO-1	Introduction to IoT Levels and Deployments	Layer 3: Applications and Analytics Layer:	IoT Access Technologies-Introduction	Lamba Architecture	Scenario 4: Right-time Business Analysis and Decision making
	SLO-2	IoT Deployment Levels: 1 to 6	Analytics Versus Control Applications,	IoT Access Technologies-Definitions	Edge Streaming Analytics for IoT	DIY- Smart Experience (DiYSE) Projects- a introduction

S-7	SLO-1	IoT Security and Privacy	Data Versus Network Analytics	IoT Application transport methods-Definitions	Edge Analytics core functions	Requirements for Enabling DiY in Eco-awareness Applications
	SLO-2	IoT Data Analytics, Protocols	Data Analytics Versus Business Benefits	The Toolkit Approach for End-user Participation in the Internet of Things:	Distributed analytics systems	Technologies and Standards Relevant for DiY Eco-awareness
S-8	SLO-1	IoT Environmental challenges: excess waste disposal	Smart Services	Existing Toolkits	Network Analytics	Sensor-actuator Technologies and Middleware as a Basis for a DiY Service Creation Framework
	SLO-2	Legal Challenges for a Privacy Framework-an IoT perspective	Iot Data Management And Compute Stack: The Hierarchy Of Edge, Fog, AndCloud	I/O Boards	IoT physical servers and cloud offerings (Cloud computing for IoT)	Device Integration, Middleware Technologies
S-9	SLO-1	Privacy Enhancing Technologies for IoT	Fog Computing	HW Based Systems, Introduction to Open source boards (Arduino, Raspberry Pi and other variants)	Relevance of Cloud connectivity and IoT-Overview	Semantic Interoperabity- a requirement for IoT DiY
	SLO-2	Case Studies: Domain specific IOT Applications	Edge Computing	SW Based Solutions	Logical design using Python, Useful IoT libraries	DiY Smart Experiences Service Framework-an Introduction

Learning Resources

1. ArshdeepBahga, Vijay Madisetti, "Internet of Things, A Hands -on Approach", 1st Edition 2015, University Press, ISBN: 978-81-7371-954-7
2. InternetofThings:LegalPerspectivesbyRolfH.Weber,RomanaWeber,Springer,2010
3. Uckelmann, D., Harrison, M., & Michahelles, F. (Eds.). Architecting the Internet of Things.doi:10.1007/978-3-642-19157-2 ,2011

4. IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things by Rob Barton, Gonzalo Salgueiro, David Hanes, Publisher: Cisco Press, Release Date: June 2017, ISBN: 9780134307091 (https://www.oreilly.com/library/view/iot-fundamentals-networking/9780134307091/)

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. Paventhan Arumugum, Director (R&D), ERNET India	Dr. S. Srinivasan, Professor and Head,Dept. of Computer Science & Engineering, Anna University, Madurai	Dr.Kayalvizhi Jayavel, SRMIST
Mr. Vinay Solanki, Head IoT, Lenovo (APAC & MEA)	Dr. R. Krishnamoorthy, Professor, Department of CSE and IT, BIT Campus, Anna University, Trichy	Dr. Sreekumar, SRMIST
Mr.Hariharan Ramalingam, Vertical Delivery Head, Wipro ltd	Dr.S.Chithra Selvaraj, Associate Professor, Department of IT, SSN College of Engineering	Mr.V.Haribaabu, SRMIST

Course Code	18CSE380T	Course Name	PERVASIVE COMPUTING	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 :** Understanding the basics of pervasive computing and its application
- **CLR-2 :** Gain knowledge on the voice enabling
- **CLR-3 :** Understand the fundamental elements of pervasive computing.
- **CLR-4 :** Learn the design process of Pervasive Computing Environments and its solutions
- **CLR-5 :** Familiarize with device connectivity & web applications concepts
- **CLR-6 :** Introduce the concepts of wearale computing and security in pervasive computing

Course Learning Outcomes (CLO): At the end of this course, learners will be able to:

		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	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1 :	Understand the fundamental elements of pervasive computing.	2	80	85	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-2 :	Learn the design process of Pervasive Computing Environments and its solutions	2	75	80	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-3 :	Familiarize hardware, software and the aspects involved in pervasive computing	2	80	85	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-4 :	Apply the knowledge for implementing security	2	80	75	H	H	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-5 :	Organize the functionalities and components of PDA in pervasive computing.	2	75	85	H	-	-	H	-	-	-	-	-	-	-	-	-	-	-
CLO-6 :	Describe the user interface issues in pervasive computing.	2	75	80	H	-	-	M	-	-	-	-	-	-	-	-	-	-	-

Duration (hour)		9	9	9	9	9
S-1	SLO-1	- INTRODUCTION	Device connectivity	WAP & VOICE TECHNOLOGY, WAP and Beyond: Introduction	Wearable Computing and Sensor Systems for Healthcare - Introduction	Security and Privacy in Pervasive Networks - Introduction
	SLO-2	Pervasive Computing: Past, Present and Future Pervasive computing	Protocols: wireless	Components of the WAP	The Health Body Area Network	Security Classics - Perimeter Security - Access Control
S-2	SLO-1	Pervasive Computing Market,	mobile phone technologies	architecture	Medical and Technological Requirements of Health Sensors	Hardening Pervasive Networks - Pervasive Computational Paradigms
	SLO-2	m-Business	mobile phone technologies	WAP infrastructure,	Wearable Sensors for Vital Signals Monitoring	Pervasive Hardware
S-3	SLO-1	Application examples: Retail,	mobile internet protocol	WAP security issues	Wearable Sensors for Activity Recognition	Pervasive Networking and Middleware
	SLO-2	Application examples: Airline check-in and booking,	mobile internet protocol	Wireless Markup Language	Sensors and Signals for Emotion Recognition	Pervasive Applications
S-4	SLO-1	Healthcare	Synchronization and replication protocol	WAP push	ntra-BAN Communications in Pervasive Healthcare Systems: Standards and Protocols - IEEE 802.15.4 and ZigBee	Pervasive Distributed Application
	SLO-2	Tracking, Car information system,	Synchronization and replication protocol	Products	Bluetooth	Logic Based Level Security
S-5	SLO-1	Sales Force Automation		i-Mode	Bluetooth Low Energy	Deterministic Access Models
	SLO-2	Email access via WAP and voice	distributed services	VoiceTechnology: Basics of Speech recognition,	Integrated and Additional Solutions for Health BAN Communications	Predictive Statistical Schemes
S-6	SLO-1	A Pervasive System for Volcano Monitoring	distributed message	VoiceTechnology: Basics of Speech recognition,	Introduction - Pervasiveness and Mobility in Computing and Communications	Privacy in Pervasive Networks - Problem Definition
	SLO-2	A Pervasive Computing Platform for Individualized Higher Education	transaction protocols	Voice Standards	Context Awareness	Challenges to Privacy Protection
S-7	SLO-1	Device Technology	Security	Voice Standards	Heterogeneity	Location Dependency
	SLO-2	Hardware,	Device Management		Wireless Technologies and Standards	Data Collection
S-8	SLO-1	Human machine interface	Web Application Concepts: WWW Architecture	Speech Applications,	Middleware	Internet Service Provider (ISP) Role

	SLO-2	Bio metrics,	Protocols	Speech Applications,	Future Trends: Beyond the Middleware	Data Ownership Private Systems
S-9	SLO-1	Operating systems	Transcoding	Speech and Pervasive Computing	Pervasive Computing in Extreme Areas; The Hiker's Personal Digital Assistant	Quality of Privacy (QoP)
	SLO-2	Java for pervasive devices	Client Authentication via Internet	Speech and Pervasive Computing	Pervasive Computing in Personal Health Systems; The MyHealthService Approach	Open Issues in Privacy of Systems 'Sharing' in Personal Networks

Learning Resources	1. JochenBurkhardt, Horst Henn, Stefan Hepper, Thomas Schaech & Klaus Rindtorff, "Pervasive Computing, Technology and Architecture of Mobile Internet Applications", Pearson Education,2012.ISBN-13: 978-0201722154 2. UweHansmann, L. Merk, M. Nicklous, T. Stober, U. Hansmann, "PervasiveComputing (Springer Professional Computing) ", 2003, Springer Verlag,ISBN:3540002189 3. S. Poslad, "Ubiquitous Computing: Smart Devices, Environments and Interactions," Wiley, 2009	4. Frank Adelstein, Sandeep KS Gupta, Golden Richard III, Loren Schwiebert, "Fundamentals of Mobile and Pervasive Computing", McGraw Hill edition, 2006. ISBN-13: 978-0071412377

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
Suganya Anbumani Director of Engineering, Wealth Management, Redi2 Technologies Greater Boston Area	1. Dr. J. Prakash, MIT, Chennai, prakaiit@rediffmail.com	1.Dr.V.Kavitha, SRMIST
Saranya A T Associate at Cognizant Chennai	2. 2.Dr.Latha Karthigaa, PhD, Innovation Research Assistant, The University of Auckland	2. Mr. Haribaabu V, SRMIST

Course Code	18CSE451T	Course Name	WIRELESS SENSOR NETWORKS	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			Program Learning Outcomes (PLO)															
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Understand basic sensor network concepts																		
CLR-2 :	Know physical layer issues, Medium Access Control Protocols																		
CLR-3 :	Comprehend network and transport layer characteristics and protocols																		
CLR-4 :	Understand the network management and Middleware services																		

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO – 1	PSO – 2	PSO – 3
CLO-1 :	Understand the basic ideas about sensor network concepts with Applications and Apply the knowledge for WSN tools	2	80	85	H	H	H	H	M	M	M	M	M	H		H	H	H	H
CLO-2 :	Acquire the knowledge on wireless transmission technology ,hardware and Medium Access Protocols	2	75	80	H	H	H	H	M	M	M	M	M	H	L	H	H	H	H
CLO-3 :	Understand the basic ideas about Wireless Sensor Networks Routing protocols and network - transport layer characteristics	2	85	80	H	H	H	H	M	M	M	M	M	H	L	H	H	H	H
CLO-4 :	Apply the knowledge for network management and Middleware services	2	80	75	H	H	H	H	M	M	M	M	M	H	L	H	H	H	H

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Introduction to computer and wireless sensor networks	Wireless Transmission Technology and systems	Overview-Wireless Mac Protocols	Design Issues in WSN routing- Data Dissemination and Gathering	WSN middleware principles-
	SLO-2				Routing Challenges in WSN	
S-2	SLO-1	Motivation for a network of Wireless Sensor nodes -	Radio Technology Primer	Characteristics of MAC protocols in Sensor networks	Flooding	Middleware architecture
	SLO-2	Sensing and sensors	Available Wireless Technologies			**Data related functions, Architecture**
S-3	SLO-1	Challenges and constraints	Hardware- Telosb	Contention free MAC Protocols	Flat Based Routing – SAR	Existing middleware
	SLO-2				Directed Diffusion	**MiLAN, IrisNet**
S-4	SLO-1	Node architecture	Hardware -Micaz motes	MAC Protocols -Characteristics	MCFA Coherent processing	**AMF,DSWare**
	SLO-2	Sensing sub system		Traffic Adaptive Medium Access	Non-Coherent Processing	**CLMF**
S-5	SLO-1	Processor sub system	Time Synchronization- Clock	Y-MAC	Hierarchical Routing- LEACH,TEEN, APTEEN,PEGASIS	Operating systems for wireless sensor networks
	SLO-2	Communication interfaces-- prototypes		Low energy Adaptive Clustering		
S-6	SLO-1	Application of Wireless sensors	Synchronization Problems	Contention based MAC Protocols	Query Based Routing	Performance and traffic management
	SLO-2				Negotiation Based Routing	
S-7	SLO-1	WSN Tools- Overview and Limitations	Basics of time synchronization	Sensor MAC	Geographical Based Routing	Fundamentals of network security
	SLO-2		Time synchronization protocols	Timeout MAC and pattern MAC		
S-8	SLO-1	Contiki -Introduction	Localization	MAC protocols in ContikiOS simulator	Routing protocol simulation in contiki	Network security Challenges
	SLO-2		Ranging Techniques	Nullmac in Contiki simulator	RPL objective function &simulation using DGRM model cooja	
S-9	SLO-1	Characteristics of Contiki WSN simulator	Range based Localization Range Free Localization	CSMA in Contiki simulator	RPL(Routing Protocol for Low-Power and Lossy Networks) Border Router simulation in Contiki 2.7 OS	Attacks Protocols mechanisms for security
	SLO-2		Event driven Localization			

Learning Resources	1. Kazem Sohraby, Daniel manoli , "Wireless Sensor networks- Technology, Protocols and Applications", Wiley InterScience Publications 2013. 2. Waltenegus Dargie, Christian Poellabauer , "Fundamentals of Wireless Sensor Networks, Theory and Practice", Wiley Series on wireless Communication and Mobile Computing, 2011 3. S.Swapna Kumar, "A Guide to Wireless Sensor Networks", kindle Edition, USP publications,2017 4. C.S Raghavendra, Krishna M.Sivalingam, Taieb znati , "Wireless Sensor Networks", Springer Science 2010.	5. Bhaskar Krishnamachari , " Networking Wireless Sensors", Cambridge University Press, 2005 6. https://www.amazon.in/Guide-Wireless-Sensor-Networks-ebook/dp/B072R53JJM 7. https://anrg.usc.edu/contiki/index.php/Contiki_tutorials 8. file:///C:/Users/Administrator.RD27/Downloads/Fundamentals-of-Wireless-Sensor-Networks-Waltenegus-Dargie.pdf	

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	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.Anirban Chowdhry, Director, Frugal Labs	1. Dr. P.T.V. Bhuvaneshwari, Professor, MIT campus, Anna University	**1.** Dr. Revathi Venkatraman, **SRMIST** **2.** Dr.N.Snehalatha, **SRMIST** **3. Dr.MB.Mukesh krishnan, SRMIST**

Course Code	18CSE452T	Course Name	NETWORK PROTOCOLS AND PROGRAMMING	Course Category	E	Professional Elective	L 3	T 0	P 0	C 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			Program Learning Outcomes (PLO)															
			1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Describe the importance of various Internet protocols like ARP, RARP, ICMP, Multicasting and multi routing, SCTP																			
CLR-2 :	Understand the transport layer protocols , application layer protocol and its characteristics																			
CLR-3 :	Learn and Understand IPV6 technologies																			
CLR-4 :	Work with client server sockets and develop related applications to communicate with each other.																			
CLR-5 :	Understand the wide area network protocols																			
CLR-6 :	Learn the basics of MPLS protocol																			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	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 & TeamWork	Communication	Project Mgt. & Finance	Life Long Learning	PSO-1	PSO-2	PSO-3
CLO-1 :	Identify the basics of different types of network and transport layer protocols	2	80	85	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-2 :	Design and implement the socket programming	2	75	80	H	H	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-3 :	Enumerate the types of application layer protocols	2	85	80	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-4 :	Analyze and compare the IPv4 and IPv6 protocols	2	80	75	H	H	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-5 :	Familiarize with wide area technologies	2	75	85	H	-	-	H	-	-	-	-	-	-	-	-	-	-	-
CLO-6 :	Describe the working of MPLS protocol	2	80	85	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Duration (hour)		9	9	9	9	9
S-1	SLO-1	IP header	Byte ordering	DNS	IPV6 Overview	DSL
	SLO-2	IP fragmentation	Byte ordering conversion functions	DNS in the Internet,	IPV6 Features	Other DSL Technology
S-2	SLO-1	ARP	System calls	DNS Resolution	IPV6 Addressing Modes	DSL Benefits
	SLO-2	RARP	Sockets	DNS Messages	IPV6 Address Types	Cable Technology
S-3	SLO-1	ICMP -introduction	System calls used with Sockets	TELNET	Introduction	Compare DSL Vs Cable
	SLO-2	ICMP-Messages	Iterative and concurrent server	SSH	Address Space Allocation	Frame Relay
S-4	SLO-1	Debugging tools	Socket Interface	FTP	Global Unicast Addresses	ATM Introduction
	SLO-2	ICMP package	Structure and Functions of Socket	TFTP	Autoconfiguration	ATM Cell Format
S-5	SLO-1	UDP Datagram	Remote Procedure Call	WWW Architecture	Renumbering	ATM Layer
	SLO-2	UDP characteristics	RPC Model, Features	WWW Documents	IPV6 Routing Protocols	AAL Layer
S-6	SLO-1	TCP Header	TCP Client Server Program	HTTP	Introduction	ATM Application
	SLO-2	TCP connection establishment process	Input, Output Processing Module	HTTP Request and Reply	IPV6 Packet Format	PPP
S-7	SLO-1	TCP Error Control	UDP Client Server Program	DHCP Operation	Comparison between IPV4 and IPV6 Header	PPP Services, Components
	SLO-2	TCP Congestion Control	UDP Control block table & Module	DHCP Configuration	IPV4 to IPV6 Tunneling	PPP frame and byte stuffing
S-8	SLO-1	TCP Flow Control	UDP Input & Output Module	SMTP	IPV4 to IPV6 Translation Techniques	HDLC
	SLO-2	Multicasting	SCTP Sockets	POP3	NAT Protocol Translation	HDLC Transfer Modes, Frame
S-9	SLO-1	Multicasting and Multicast Routing Protocol	SCTP Services and Features, Packet Format	IMAP	IPV6 Mobility	Types of HDLC Frame
	SLO-2	Stream Control Transmission Protocol	SCTP Client/Server	MIME	Protocols Changed to Support IPV6	MPLS

Learning Resources	1. Behrouz A. Forouzan, "TCP IP Protocol Suite" 4th edition, 2013, McGraw-Hill ISBN:0073376043 2. Douglas E. Comer, Internetworking with TCP/IP, Principles, protocols, and architecture, Vol 15th Edition, 2006 ISBN: 0131876716, ISBN:978-0131876712	3. Richard Stevens, Unix Network Programming, vol.1, 3rd edition, 2003, McGraw-Hill ISBN 0-07-246060-1

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.Thamaraiselvam,zoho, thamaraiselvam.s@zohocorp.com	1.Dr.Ema,Anna University Chennai,umaramesh@auist.net	1. Dr. G.Usha,SRMIST,Dr.J.Kalaivani,SRMIST
2.Mr.Mithun, Cognizant,Mithun.SS@cognizant.com	2.Dr.KunvarSingh,NITTrichy,kunwar@nitt.edu	2. Mr.J.GodwinPon,SRMIST

Course Code	18CSE453T	Course Name	NETWORK ROUTING ALGORITHMS	Course Category	E	Professional Elective	L 3	T 0	P 0	C 3

Pre-requisite Courses	18CSC302J	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 how addressing and routing are tied together and different architectural components are related to routing.*
CLR-2 :	*Gain knowledge on the need for routers, its functionality and different architectures.*
CLR-3 :	*Understand fundamental basis of various algorithms in centralized and distributed point of view.*
CLR-4 :	*Apply the knowledge of IP addressing in various routing algorithms.*
CLR-5 :	*Understand the various types of key routing protocols used in wireless networks.*
CLR-6 :	*Gain knowledge on past experiences and prepare for next generation networks and routing*

Course Learning Outcomes (CLO): *At the end of this course, learners will be able to:*

		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 & TeamWork	Communication	ProjectMgt.&Finance	LifeLongLearning	PSO-1	PSO-2	PSO-3
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1 :	*Acquire the knowledge of how data transfer happens in conventional networks*	2	80	85	H	M	-	-	L	-	-	-	-	M	-	H	-	-	-
CLO-2 :	*Comprehend Router Architectures and IP Address Lookup Algorithms*	2	75	80	H	H	M	M	L	-	-	-	-	-	-	L	H	-	-
CLO-3 :	*Compare routing techniques and protocols*	2	85	80	H	H	L	M	M	-	-	-	M	-	L	H	-	-	-
CLO-4 :	*Examine how different dimensions of routing differ for different types of network*	2	80	75	H	H	H	H	H	L	-	M	M	-	-	H	-	-	-
CLO-5 :	*Apply various routing algorithms in wireless network scenario.*	2	75	85	H	H	H	H	M	-	-	-	M	-	-	H	-	-	-
CLO-6 :	*Understand various routing paradigms in next generation*	2	80	85	H	H	H	M-	M	L	-	-	-	-	-	H	-	-	-

Duration (hour)	8	9	9	9	10
S-1 SLO-1	Network Routing: An Introduction to Routing algorithms	Router Architectures: Basic Forwarding Functions	Bellman-Ford algorithm	Routers, Networks, and Routing Information: Some Basics	Routing in Wireless Networks: Internet based mobile ad-hoc networking
SLO-2	Functions of Router	Routing table versus forwarding table	Distance Vector Approach	Routing Table, Communication of Routing Information	Classifications of routing protocols
S-2 SLO-1	IP addressing- Classful Addressing	Types of router	Dijkstra's Algorithm	Routing Information Protocol, Version 1 (RIPv1)	Table-Driven Routing Protocols: Destination Sequenced Distance-Vector Routing Protocol
SLO-2	Classless Addressing	Elements of Router	Comparison of Bellman-Ford and Distance Vector Approach	Routing Information Protocol, Version 2 (RIPv2)	Cluster-Head Gateway Switch Routing Protocol
S-3 SLO-1	Protocol architecture stack – OSI Reference Model	Packet Flow	Shortest Path Computation with Candidate Path Caching	Interior Gateway Routing Protocol (IGRP)	On-Demand Routing Protocols: Dynamic Source Routing Protocol
SLO-2	IP Protocol Stack Architecture	Packet Processing	Widest Path Computation with Candidate Path Caching	Enhanced Interior Gateway Routing Protocol (EIGRP), Route Redistribution	Ad Hoc On-Demand Distance-Vector Routing Protocol
S-4 SLO-1	Network Topology Architecture	Shared CPU architecture, Shared forwarding Engine Architecture	Widest Path Algorithm	OSPF: Protocol Features	Hybrid Routing Protocols: Core Extraction Distributed Ad Hoc Routing Protocol
SLO-2	Network Management Architecture	Shared Nothing Architectures, Clustered Architectures	k-Shortest Paths Algorithm	OSPF Packet Format	Zone Routing Protocol
S-5 SLO-1	Public Switched Telephone Network	Impact of Addressing on lookup	Routing Protocol, Routing Algorithm, and Routing Table	Integrated IS-IS	Routing Protocols With Efficient Flooding Mechanisms : Preferred Link-Based Routing Protocols
		Longest Prefix Matching	Routing Information Representation and Protocol Messages	Similarities and Differences Between IS-IS and OSPF	Optimized Link State Routing
S-6 SLO-1	Communication Technologies	Naïve Algorithms, Binary Tries	Distance Vector Routing Protocol	IP Traffic Engineering: Traffic, Stochasticity, Delay, and Utilization Applications' View	Hierarchical Routing Protocols
					Power-Aware Routing Protocols

S-7	SLO-1	Standard Committees – International Telecommunication Union	Multi-bit Tries	Link State Routing Protocol	Traffic Engineering: An Architectural Framework	Toward Next Generation Routing:Quality of Service Routing
	SLO-2	Internet Engineering Task Force, MFA Forum	Compressing multi-bit strides		Traffic Engineering: A Four-Node Illustration	
S-8	SLO-1	Type Length Value	Search By Length Algorithms	Path Vector Routing Protocol	BGP Operations, configuration, faces of BGP	Multiprotocol Label Switching(MPLS)
	SLO-2	Network Protocol Analyzer	Search By value approaches	Network Flow Modeling: Single-Commodity Network Flow	BGP Decision Process	Generalized MPLS
S-9	SLO-1		Hardware Algorithms		Internal BGP Scalability	Routing and Traffic Engineering with MPLS
	SLO-2		Comparing Different Approaches	Multicommodity Network Flow: Three-Node Example	Protocol Message Format	
S-10	SLO-1 SLO-2					PSTN Call Routing Using the Interne

Learning Resources	1. D.Medhi and K.Ramasamy, Network Routing : Algorithms, Protocols and Architectures, MorganKaufmann Publishers, First Edition2007. 2. C.Siva Ram Murthy and B.S.Manoj, Adhoc Wireless Networks, Pearson Education,2007. 3. D.Medhi and K.Ramasamy, Network Routing : Algorithms, Protocols and Architectures, Morgan Kaufmann Publishers, Second Edition2017.	4. SteenStrubM,RoutinginCommunicationnetworks,PrenticeHallInternational,1995. 5. InternetworkingTechnologiesHandbook,Inc.CiscoSystems,ILSGCisco

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
Mr.T.Bernald , Senior Consulatant , TCS Chennai. bernald.t@tcs.com (waiting for approval)	Dr. S.Anbuchelian, Anna University. anbuchelian@annauniv.edu	1. Dr.FemildaJosephin J S,SRMIST
		2. Mr.RajeshBabu,SRMIST
		3. Mr. J.Godwin,SRMIST

Course Code	18CSE454T	Course Name	HIGH PERFORMANCE COMPUTING	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 Engineering	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	To learn about Modern Processors and concepts
CLR-2 :	To understand the basic concepts of optimizations
CLR-3 :	To learn about Parallel Computers and programming
CLR-4 :	To understand the basic concepts of parallelization
CLR-5 :	To Study about Memory Parallel Programming using OpenMP
CLR-6 :	To Study about Memory Parallel Programming using and MPI

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment(%)	Engineering Knowledge	Problem Analysis	Design&Development	Analysis,Design, Research	ModernToolUsage	Society&Culture	Environment& Sustainability	Ethics	Individual & TeamWork	Communication	ProjectMgt.&Finance	LifeLongLearning	PSO-1	PSO-2	PSO-3
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1 :	Acquire the knowledge of Modern processors and concepts	2	80	85	H	H	-	-	-	-	-	-	-	H	-	-	-	-	-
CLO-2 :	Understand the basic ideas about Optimizations	2	75	80	-	H	-	-	-	-	-	-	-	-	-	-	-	-	H
CLO-3 :	Acquire the ability to identify parallel computers	2	85	80	-	-	H	-	-	-	-	-	M	-	L	-	-	-	-
CLO-4 :	Appreciate the concepts of parallelization	2	80	75	-	H	-	-	H	-	L	L	-	H	-	-	H	-	-
CLO-5 :	Apply the knowledge on parallel programming using Open MP	2	75	85	-	-	-	H	-	L	L	-	-	-	-	-	-	-	-
CLO-6 :	Acquire the knowledge on parallel programming using MPI	2	80	85	-	-	-	-	-	-	-	-	-	-	-	-	H	H	-

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Stored Program Computer Architecture	Scalar profiling- Function- and line-based runtime profiling	Taxonomy of parallel computing paradigms	Introduction to OpenMP	Distributed-memory parallel programming with MPI- Message passing
	SLO-2	General-ptupose cache-based microprocessor architecture	Hardware performance counters .	Shared-memory computers	Parallel execution	introduction to MPI
S-2	SLO-1	Performance based metrics and Benchmarks	Manual instrumentation	Cache coherence	Data scoping	Messages and point-to-point communication, Collective communication
	SLO-2	Transistors galore:	Common sense optimizations- Do less work!	UMA – ccNUMA	OpenMP worksharing for loops	Nonblocking point-to-point communication
S-3	SLO-1	Moore's Law	Avoid expensive operations!	Distributed-memory computers	Synchronization	Virtual topologies
	SLO-2	Pipelining	Shrink the working set!	Hierarchical (hybrid) systems	Reductions	Example: MPI parallelization of a Jacobi solver
S-4	SLO-1	Superscalarity	Simple measures, large impact- Elimination of common subexpressions	Networks- Basic performance characteristics of networks	Loop scheduling, Tasking	MPI implementation
	SLO-2	SIMD	Avoiding branches	Buses, Switched and fat-tree networks	Miscellaneous	Performance properties, MPI performance tools
S-5	SLO-1	Memory hierarchies	Using SIMD instruction sets	Mesh networks, Hybrids	Case study: OpenMP-parallel Jacobi algorithm	Communication parameters
	SLO-2	Cache	The role of compilers	Parallelism- Data parallelism	Advanced OpenMP: Wavefront parallelization	Synchronization, serialization, contention
S-6	SLO-1	Cache mapping	General optimization options	Functional parallelism	Efficient OpenMP programming	Implicit serialization and synchronization
	SLO-2	Prefetch	Inlining, Aliasing	Parallel scalability	Profiling OpenMP programs	Contention
S-7	SLO-1	Multicore processors	Computational accuracy	Factors that limit parallel execution	Performance pitfalls	Reducing communication overhead
	SLO-2	Multithreaded processors	Register optimizations, Using compiler logs	Scalability metrics, Simple scalability laws	Ameliorating the impact of OpenMP worksharing constructs	Optimal domain decomposition

S-8	SLO-1	Vector processors-	C++ optimizations- Temporaries	Parallel efficiency, Serial performance versus strong scalability	Determining OpenMP overhead for short loops	Aggregating messages
	SLO-2	Design principles	Dynamic memory management	Refined performance models	Serialization	Collective communication
S-9	SLO-1	Maximum performance estimates	Loop kernels and iterators	Choosing the right scaling baseline	False sharing	Nonblocking vs. asynchronous communication,
	SLO-2	Programming for vector architectures	Storage order- Case study: Jacobi algorithm and Dense matrix transpose.	Load imbalance	Case study: Parallel sparse matrix-vector multiply	Understanding intranode point-to-point communication

Learning Resources	1. GeorgHager,GerhardWellein,"IntroductiontoHighPerformanceComputingforScientistsand Engineers",Chapman&Hall/CRCComputationalScienceseries,2011.. 2. JohnLevesque,GeneWagenbreth,"HighPerformanceComputing:Programmingand Application"CRC Press,2010	3. KaiHwang,Zhiweixu"ScalableParallelComputing:Technology,Architecture,Programming", 4. CharlesSeverance,KevinDowd,"HighPerformanceComputing",O'ReillyMedia,2ndEdition,1998.

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.Kesavan, HCL Technologies**	**1. Dr. Surendran Rajendran, AMA International University, Bahrain**	**1. J. Godwin Ponsam, SRMIST**
2. **Mr.R.Celein , Symmantec India Limited**		**2. Mr.SivakumarSRMIST**
		3.. Mr. Jothikumar, SRMIST

Course Code	18CSE456T	Course Name	SOFTWARE DEFINED NETWORKS		Course Category	E	Professional Elective	L	T	P	C
								3	0	0	3

Pre-requisite Courses	15CSC302J		Co-requisite Courses	Nil		Progressive Courses	
Course Offering Department		CSE		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 :	cover topics more advanced than a typical undergraduate networking course																			
CLR-2 :	prepare students for a market that is going to demand computer scientists and software engineers to deliver the next generation of network switches																			
CLR-3 :	describe the principles by which large computer networks and applications atop them are designed and maintained																			
CLR-4 :	Make students understand the state-of-the art networking technologies proposed in literature or used throughout industry in a variety of areas																			
CLR-5 :	Make students learn to critique research literature through a number of paper reviews and attempt to improve the state-of-the-art through minor and major projects																			

Course Learning Outcomes (CLO):	At the end of this course, learners will::	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 :	have a knowledge of the technology evolution leading to SDN as well as the Open Source role in SDN and OpenFlow specifications	3	75	80	H	M	H	-	H	-	-	-	-	-	-	H	H	H	H
CLO-2 :	gain a knowledge of the advantages and disadvantages of SDN, API approaches, Hypervisor overlays, and Data Center SDN, SDN WAN etc	3	75	80	H	M	H	-	H	-	-	-	-	-	-	H	H	H	H
CLO-3 :	Understand different network virtualization techniques and can deploy SDN/NFV applications	3	75	80	H	M	H	-	H	-	-	-	-	-	-	H	H	H	H
CLO-4 :	understand the economics of SDN and its impacts in the marketplace	3	75	80	H	M	H	-	H	-	-	-	-	-	-	H	H	H	H

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Introduction	Why SDN? Genesis of SDN	Alternative definitions of SDN	Emerging SDN Models	SDN Ecosystem
	SLO-2	How to Read a Paper (S. Keshav)	How SDN Works	Potential drawbacks of Open SDN	Protocol Models: NETCONF, BGP, MPLS	White-box switching
S-2	SLO-1	Ho to Review a Paper (Timothy Roscoe), How to Disagree (Paul Graham)	SDN Evolution, SDN Basics	SDN via APIs	Controller Models	Open Sourcing SDN
	SLO-2	Networking Basics: Switching, Addressing, Routing	SDN Architecture	SDN via Hypervisor-Based Overlays	Application Models: Proactive, Declarative, External	Open Networking Foundation
S-3	SLO-1	Paper Reading: 4D	Plane Separation	SDN via Opening Up the Device	SDN in Datacenters: Multitenancy, Failure Recovery	OpenDaylight
	SLO-2	Paper Reading: 4D	Simple Device and Centralized Control	Building our own SDN Switch	SDN in Internet eXchange Points (IXPs)	The ONOS Project
S-4	SLO-1	Paper Reading: ALF	Network Automation and Virtualization	SDN on Raspberry Pi, Zodiac Fx	Tunneling and Path Technologies, Ethernet Fabrics in the Data Center	Hypervisors: Background, Types
	SLO-2	Paper Reading: ALF	Openness, Northbound and Southbound APIs	Ryu on Raspberry Pi, Zodiac Fx	SDN Use Cases, Open SDN versus Overlays in the Data Center	OpenStack Deployment
S-5	SLO-1	Switching Architecture: Data, Control, and Management Planes	Paper Reading: OpenFlow: Enabling Innovation in Campus Networks	Network Function Virtualization (NFV)	Real-World Data Center Implementations, SDN in Other Environments	OpenStack Orchestration
	SLO-2	Hardware Lookup	Review 1	Review 2	Review 3	Review 4

S-6	**SLO-1**	Forwarding Rules	OpenFlow, Switch-Controller Interaction	SDN vs. NFV	Wide Area Networks	OpenSwitch
	SLO-2	Dynamic Forwarding Tables	Flow Table, Packet Matching	OPNFV	Paper Reading: B4: Experience with a Globally-Deployed Software Defined WAN, SIGCOMM, 2013	Reactive versus Proactive Applications
S-7	SLO-1	Autonomous Switches and Routers	Actions and Packet Forwarding	Service Creation and Chaining	Service Provider and Carrier Networks	Analyzing Simple SDN Applications
	SLO-2	Internet Architecture	Extensions and Limitations	NFV Orchestration	Campus Networks	Other SDN Applications
S-8	SLO-1	Control-Data Plane Separation	Paper Reading: P4: Programming Protocol-Independent Packet Processors	Creating Network Virtualization Tunnels	Hospitality Networks, Mobile Networks	Future of SDN
	SLO-2	Packet Scheduling	SDN Controllers: POX, RyuMininet Programming	Offloading Flows in the Data Center	In-Line Network Functions	SDN Security
S-9	SLO-1	Paper Reading: The Road to SDN: An Intellectual History of Programmable Networks	SDN Controllers: OpenDaylight, Mininet Programming	Access Control for the Campus	Optical Networks	Use Cases
	SLO-2	Project Proposal Due	SDN Controllers: ONOS, Mininet Programming	Traffic Engineering for Service Providers	SDN vs. P2P/Overlay Networks	Group Project Presentation

Learning Resources	1. *Software Defined Networks: A Comprehensive Approach, 2nd Edition Morgan Kaufmann, 2016*	3. *Network Function Virtualization, Ken Gray, Thomas D. Nadeau, Morgan Kaufmann, 2016*
	2. *SDN: Software Defined Networks, Thomas D. Nadeau, Ken Gray, O'Reilly Media, 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. **Dr. Femilda**
		2. **Mr. K. Venkatesh**
		3. **Mr. KarthickNanmaran**

Course Code	18CSE458T	Course Name	WIRELESS AND MOBILE COMMUNICATION	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:

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 fundamental of transmission and cellular systems																			
CLR-2 :	Apply skills in real time engineering problems and can have capability to evaluate the transmission errors																			
CLR-3 :	Comprehend the concept of mobile network, transport layer and wireless technologies																			
CLR-4 :	Differentiate the various types of cellular standard by their unique services.																			
CLR-5 :	Grasp GSM. GPRS, Handover and Localization techniques																			
CLR-6 :	Apply skills in various Routing protocols																			

Learning column headers: Level of Thinking (Bloom), Expected Proficiency (%), Expected Attainment (%)

PLO headers: 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

Course Learning Outcomes (CLO): At the end of this course, learners will be able to:

		Lvl	Prof	Att		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1 :	Apply Wireless Technology concepts to Engineering problems related to communication	3	80	70		H	H	H	H	H	H	H	H	H	M	H	H	H	H
CLO-2 :	Improve their knowledge on Digital and analog Modulation techniques.	3	85	75		H	H	H	H	H	H	H	H	H	M	H	H	H	H
CLO-3 :	Equip themselves familiar with principle of Mobile Communication	3	75	70		H	H	H	H	H	H	H	H	H	M	H	H	H	H
CLO-4 :	Familiarize with Digital Cellular Standards	3	85	80		H	H	H	H	H	H	H	H	H	M	H	H	H	H
CLO-5 :	Acquaint with routing protocols	3	85	75		H	H	H	H	H	H	H	H	H	M	H	H	H	H
CLO-6 :	Expose to the emerging wireless technologies	3	80	70		H	H	H	H	H	H	H	H	H	M	H	H	H	H

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Introduction to wireless communication	Cellular Concept	Introduction to GSM	Mobile IP	IEEE 802.11
	SLO-2	Elements of wireless communication system	Cell area	Frequency Bands and Channels	IP packet delivery	System Architecture
S-2	SLO-1	Frequencies for radio communication	Signal strength	Frames in GSM	Tunneling – Reverse Tunneling	Protocol Architecture
	SLO-2	Signals, Noise – Types of Noise	Cell parameter	Planes and layers of GSM	IPv6	MAC Layer and Management
S-3	SLO-1	Introduction to modulation and demodulation	Capacity of Cell	Protocols	DHCP	802.11a, 802.11b
	SLO-2	Signals in the modulation	Co channel interference	Localization and calling	Tradition TCP	HIPERLAN
S-4	SLO-1	Introduction to Analog modulation schemes	Frequency reuse	Handoff – Short messaging system	Congestion control	Bluetooth Architecture
	SLO-2	Amplitude Modulation Frequency modulation	Cell splitting Cell sectoring	GPRS EDGE	Classical TCP Snooping ,	IEEE 802.15 IEEE 802.15.4
S-5	SLO-1	Phase Modulation Introduction to Analog modulation schemes	Multiple Radio access protocols Frequencydivision Multiple Access	3G CELLULAR SystemsMMS	Mobile TCPFast retransmit / Fast recovery	MANET characteristicsROUTING
	SLO-2	Amplitude Shift Keying Frequency Shift Keying Phase Shift Keying- BPSK, QPSK	Time division Multiple Access Fixed ALOHA , Slotted ALOHA	UMTS Release and standards UMTS system architecture UTRAN	Transaction oriented TCP TCP over 2.5/3G wireless Networks	AODV Routing VANETCommunications in VANET
S-6	SLO-1	Multiplexing and multiple access techniques	Multiple Access with Collision Avoidance	Handover	Introduction to WAP WAP Architecture	Wireless Sensor Networks
S-7	SLO-1	Frequency-division multiplexing	Space division Multiple Access Code division Multiple Access	Satellite System Infrastructure- GEO, LEO, MEO	Wireless Datagram ProtocolWireless Transaction Protocol	RFID TechnologyTwo tags of RFID
	SLO-2	Time-division multiplexing	Spread ALOHA multiple Access	Limitations of GPS	Wireless Session Protocol	Wi-Fi Standards

S-8	SLO-1	Code-division multiplexing	OFDM	GPSBeneficiaries of GPS	Wireless Transport Layer Security	WiMax Standards
	SLO-2	Spread spectrum modulation	Variants of OFDM			
S-9	SLO-1	frequency hopping Spread spectrum	Comparison of Multiple Access Technique	4G Cellular systems	Wireless Markup Language	Fem-to-Cell Network
	SL0-2	Direct Sequence Spread spectrum		4G Standards (LTE/WiMax)	Push Architecture	Push-to-talk technology for SMS

Learning Resources	1. Roy Blake, Wireless Communication Technology" CENGAGE learning, Sixth indian reprint 2013. 2. Dharma Prakash Agarwal, Qing-An Zeng , "Introduction to Wireless and Mobile Systems" CENGAGE learning, First edition 2014. 3. Jochen Schiller, "Mobile Communications", Addision Wesley, 2nd edition 2011. 4. Singal TL, "Wireless Communication", Tata McGraw Hill Education Private Limited. 5. G.I.Papadimitriou, A.S.Pomportsis, P.Nicopolitids, M.S.Obaidat, "Wireless Networks", John Wiley and Sons, 2003	6. Gray J.Mullet "Wireless Telecommunication System and Networks", CENGAGE learning, reprint 2014. 7. Upena Dalal, "Wireless Communication" Oxford University Press, First edition 2009. 8. Kaveh Pahlavan & Prashant Krishnamurthy, "Wireless Networks" PHI 2002. 9. Martyn Mallick, "Mobile and Wireless Design Essentials", Wiley Dreamtech India Pvt.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	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.Madan Lakshmanan	Prof. Subra Ganesan	Dr.S.Suresh
Senior Scientist	Professor, Electrical and Computer Engineering	Mrs.Jeya
CEERI, CSIR, Chennai (R&D Industry)	Oakland University, USA	Mr.H.Karthikeyan

Course Code	18CSE459T	Course Name	SERVICE ORIENTED ARCHITECTURE	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 Enginering	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR): *The purpose of learning this course is to:*

CLR-1 :	*Learn service oriented analysis techniques*
CLR-2 :	*Learn technology underlying the service design*
CLR-3 :	*Learn advanced concepts in building SOA*
CLR-4 :	*Understand the Java Web services*
CLR-5 :	*To know about various Web services specification standards*
CLR-6 :	

Course Learning Outcomes (CLO): *At the end of this course, learners will be able to:*

Learning columns: 1 = Level of Thinking (Bloom), 2 = Expected Proficiency (%), 3 = Expected Attainment (%)

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

CLO	Description	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1 :	*Acquire the knowledge on service oriented design technology*	2	80	85	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-2 :	*Acquire the ability to identify web services in SOA*	2	75	80	H	H	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-3 :	*Understand the basic ideas about building SOA*	2	85	80	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-4 :	*Appreciate the concepts of standards and security on SOA*	2	80	75	H	H	-	H	-	-	-	-	-	-	-	-	-	-	-
CLO-5 :	*Apply the knowledge in Java based web servise*	2	75	85	H	-	-	H	-	-	-	-	-	-	-	-	-	-	-
CLO-6 :	*Acquire the knowledge on ASP .NET based web servises.*	2	80	85	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Introduction to SOA , Defining SOA	Introduction to Web Services	Phases of the SOA delivery lifecycle	SOA support in J2EE	Introduction to WS-BPEL
	SLO-2	Necessity of SOA.	Primitive SOA	SOA Delivery Strategies Top- down strategy, Bottom-up strategy	SOA platform basics and building blocks	Basic terms used in the BPEL terminology
S-2	SLO-1	SOA timeline from XML to Web services to SOA	Web Service Framework with respect to SOA	Agile strategy with Pros and cons	Overview of Java API for XML-based web services(JAX- WS)	WS-Coordination overview
	SLO-2	History about XML	Logical components of the Web services framework	Objectives and service-oriented process steps	Java Architecture for XML binding (JAXB)	WS-Choreography
S-3	SLO-1	Web Services and SOA	Service descriptions with WSDL layout	Benefits of a business-centric SOA	Building web services and client with examples	WS-Policy with SOA
	SLO-2	Service Oriented Enterprise (SOE)	Meta data and service contracts	Service- oriented design	Introduction to Java API for XML Registries(JAXR)	WS Security
S-4	SLO-1	Analyze the past architectures	Messaging with SOAP protocol and SOAP nodes	Introduction to WSDL language basics	Java API for XML based RPC (JAX-RPC)	Notification and Eventing
	SLO-2	Scope Of SOA	SOAP message path	Define the structure of WSDL	Web Services Interoperability	Transaction Management
S-5	SLO-1	SOA Reference Model	Message exchange Patterns and Coordination	Implement sample WSDL file	SOA support in .NET	Case study-SOA in cloud
	SLO-2	Key Service characteristics of SOA	Web Services a Activity Management,	Introduction to SOAP basics	.NET Platform overview	research focus on SOA and issues
S-6	SLO-1	Anatomy of SOA	Coordination types and protocols	SOAP language basics	ASP.NET Page Handling	Comparative Analysis of SOA and Cloud Computing
	SLO-2	SOA architecture	ACID properties	Structure of SOAP	Post back vs Non post back events	

S-7	SLO-1	Components in SOA interrelate	Analyze atomic transaction with SOA	Implement SOAP style web services in Java.	ASP.NET web services	Case Study On Vehicle management system- create a service for identify the vehicle by entering the vehicle number.
	SLO-2	SOA component and specific behaviors	Business activities and protocols	SOA Composition	Creating a Web Site Using Visual Studio IDE	
S-8	SLO-1	Relationships among these components	Orchestration	service layers and standards	ASP.NET Programming Basics	Case Study on Online Healthcare System-Design an API to help healthcare providers collect, store, retrieve and exchange patient healthcare information more efficiently and enable better patient care.
	SLO-2	Technical Benefits of SOA	Choreography	Entity-centric business service design: List the step-by-step process	Creating a Web Site Using Visual Studio IDE	
S-9	SLO-1	Business Benefits of SOA	Service layer configuration scenarios	Application service design: process steps	Case Studies: Implement the Small Business Customer Management application as a web applications using ASP.NET	Case study on Simple Library Management System using API to get, post, edits and update book data from server.
	SLO-2	Principles of service orientation	Application Service Layer	Task centric business service design process steps	Web Services Enhancements (WSE)	

Learning Resources	1. Thomas Erl,"Service-OrientedArchitecture:Concepts,Technology,andDesign",PearsonEducation,2009. 2. EricNewcomer,Lomow,"UnderstandingSOAwithWebServices",PearsonEducation,2005 3. JamesMcGovern,SameerTyagi,MichaelEStevens,SunilMathew,"JavaWebServices Architecture",Elsevier,2003.	1.AchievingService-OrientedArchitecture:ApplyinganEnterpriseArchitectureApproach,RickSweeney,2010 2. Shankar Kambhampaly, "Service –Oriented Architecture for Enterprise Applications", Wiley India Pvt Ltd, 2008 3.Newcomer, Lomow, "Understanding SOA with Web Services", Pearson Education, 2005 4.Sandeep Chatterjee, James Webber, "Developing Enterprise Web Services, An Architect's Guide", Pearson Education,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

Course Code	18CSE460T	Course Name	NETWORK DESIGN 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 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
CLR-1 :	Understand the various type of Networks and the Network Management basics																			
CLR-2 :	Understand the Network Management Standards																			
CLR-3 :	Understand the working of Simple Network Management Protocol and its various versions																			
CLR-4 :	Understand the working of Remote Monitoring		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 & TeamWork	Communication	Project Mgt. & Finance	LifeLong Learning	PSO-1	PSO-2	PSO–3
CLR-5 :	Understand the Network Management Applications																			
CLR-6 :	To Understand Network Designing and Planning																			

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																			
CLO-1 :	Acquire knowledge on networks and network management		1	70	75	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-2 :	Gain knowledge of the various standards		1	75	80	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-3 :	Gain knowledge on the working of SNMP protocol and its various applications		1	85	80	H	-	-	-	M	-	-	-	M	-	-	-	-	-	-
CLO-4 :	To apply the network management tools and gather information from the network		2	75	70	H	-	-	-	M	-	-	-	M	-	-	-	-	-	-
CLO-5 :	To Familiarize with the working of various management applications		2	75	80	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-6 :	Apply the knowledge to create an efficient network		3	70	75	H	H	H	H	H	-	-	-	H	-	-	-	-	-	-

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Telephone Network Management	Introduction to SNMP	Remote Monitoring	Network Management Applications	Network Design and Planning
	SLO-2	Distributed Computing Environment	SNMP v1 model	RMON SMI and MIB	Fault Management -Architecture	Network Design for Enterprise Network
S-2	SLO-1	TCP/IP Based Networks	Organization Model	RMON1	Fault location ,Fault isolation	Network Design Process
	SLO-2	Communication Protocols and Standards	System overview	RMON2	Algorithm	Data Collection
S-3	SLO-1	Protocol Layer and Services	SNMP v1 Information model	System Utilities for Management	Self-healing	Data Generation
	SLO-2	Challenges of IT Managers	Structure of Management Information	Tools	Avoiding failures	Traffic Generators
S-4	SLO-1	Network Management	Managed Objects	Network Statistics Measurement Systems	Configuration setting,	Cost Generators
	SLO-2	Network and System Management	MIB-Object Group	Traffic Load	Configuration discovery and Change Control	Topology
S-5	SLO-1	Network Management System Platform	System Group, Interfaces Group, Address Translation group	Protocol Statistics	Configuration Management Applications	Architecture
	SLO-2	Current status and future of Network Management	IP Group, ICMP Group, TCP Group, UDP Group	Data and Error Statistics	Patch Management	Graph
S-6	SLO-1	Network Management Standards	SNMP v1Communication model	Network Management System	Approaches for Performance Management	Link
	SLO-2	Network Management Model - Organizational model	Functional model	Components, Requirements	Performance Monitoring and Reporting	Algorithms
S-7	SLO-1	Information Model	SNMPv2	System Management	Performance trouble shooting,	Network Design Techniques
	SLO-2	Management Information Trees	System Architecture, MIB, Protocol	Network Management Applications	Capacity Planning	Performance Analysis
S-8	SLO-1	Communication Model	SNMPv3	Configuration Management	Account Management	Queuing Essentials
	SLO-2	ASN.1	Architecture, Applications, MIB	Inventory Management	Report Management-System and User Reports	Loss and Delay
S-9	SLO-1	Terminology, Symbols and Conventions	User Based Security Model	Performance Management	Policy Management	Reliability
	SLO-2	Functional Model	Access Control	Tools	Service Level Management	Network Cost

Learning Resources	1.Mani Subramanian "Network Management Principles and Practice", Second Edition, Pearson Publication, 2012. 2. DineshChandraVerma,"PrinciplesofComputerSystemsandNetworkManagement",Springer,2009.	3. Greg Tomsho, Ed Tittel, David Johnson, "Guide to Network Essentials", Fifth Edition, Cengage Learning, 2010 4.Teresa C.Piliouras ," Network Design Management and Technical Perspectives", Second Edition ,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	40 %	-	40 %	-	20 %	-	30 %	-	40%	-
	Understand										
Level 2	Apply	40 %	-	40 %	-	40 %	-	40 %	-	40%	-
	Analyze										
Level 3	Evaluate	20 %	-	20 %	-	40 %	-	30 %	-	20%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

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

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Mr.Vivekanandan ,Nokia Technology Specialist, anandanviv1@gmail.com	1.	1. Dr.B.Amutha, SRMIST
2.Mr.SanthoshKumar.S,Associate Consultant,TCS, santhosh.sansoft@gmail.com	2.	2.Dr.N.Snehalatha, SRMIST

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:

		Learning			Program Learning Outcomes (PLO)															
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Understand the 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.																		

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

Learning columns: 1 LevelofThinking (Bloom), 2 ExpectedProficiency (%), 3 ExpectedAttainment(%)

Course Learning Outcomes (CLO): At the end of this course, learners will be able to:

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
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	Tyco case
	SLO-2					

				Access control system	Measuring and streamlining the P and T process	Worldcom case
S-8	SLO-1	Information systems Design Process	Availability management,			
	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 :	

Learning

	1	2	3
	LevelofThinking (Bloom)	ExpectedProficiency (%)	ExpectedAttainment(%)

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

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	L1	L2	L3	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	PSO1	PSO2	PSO3
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 platform,features and architecture,	intent filters ,addingcategories	Managing data using SQLite databa	MultiThreading: Handlers	View Animations, DrawableAnimations
	SLO-2					
S-5	SLO-1	versions ,comparison added features in each versions.	linking activities, user interfacedesign components	Content providers:	,AsyncTask	Media and Camera API: Working withvideo and audio inputs
	SLO-2					
S-6	SLO-1	ART(Android Runtime),ADB(AndroidDebug Bridge).	Views and View Groups: Basic views,picker views, adapter views, Menu, App Baretc, basics of screen design; differentlayouts.	user content provider	android network programming:HttpUrlConnection	Camera API
	SLO-2					
S-7	SLO-1	Development environment/IDE: Android studio and its working environment	App widgets.Lollipop Materialdesign: new themes, new widgets,Cardlayouts. RecyclerView	Android in build content providers	Connecting to REST-based and SOAP based Web services	Sensor programming: Motion sensors
	SLO-2					
S-8	SLO-1	gradle build system, emulator setup	Fragments: Introduction to activities,		Broad castreceivers:LocalBroadcastManager,Dynamic broadcast receiver	Position sensors, Environmental sensors.
	SLO-2					

S-9	SLO-1	*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.*
	SLO-2					
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	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.	*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:		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 :	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	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

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																		
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 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. 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			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Be exposed to the context and operation of free and open source software (FOSS) communities and associated software projects				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
CLR-2 :	Be familiar with participating in a FOSS project																		
CLR-3 :	Learn scripting language like Python or Perl, Ruby																		
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	LevelofThin	ExpectedPr	ExpectedAtt															
CLR-4 :	Learn some important FOSS tools and techniques																		
CLO-1 :	Install and run open-source operating systems.	3	80	70	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-
CLO-2 :	Gather information about Free and Open Source Software projects from software releases and from sites on the internet.	3	85	75	M	H	L	M	L	-	-	-	M	L	-	H	-	-	-
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	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-5 :	Identify and apply various linux commands	3	85	75	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- Open Source, Free Software, Free Software vs. Open Source software	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					
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:	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Understand the 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:	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 & 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 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. *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:*

		Learning			Program Learning Outcomes (PLO)															
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Understand 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 maniputlation 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:*

Column headers: 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

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
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 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.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			Program Learning Outcomes (PLO)															
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Understand the basics of ios device and platform				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 & TeamWork	Communication	ProjectMgt.&Finance	LifeLongLearning	PSO-1	PSO-2	PSO-3
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:																				
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	
	SLO-2	Difference between IOS and Android	Literals and subscripting, Initializers, Properties, Instance methods	Programmatic controls	Nested stack views	Webservices
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	Versions	Text Input- Editing,Keyboard attributes	Timing functions	Camera	Image caching
	SLO-2					
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,6[th]ed.,Pearson,2016. 2. Jon Hoffman, Mastering Swift,4[th]ed.,Packt Publishing Ltd.,2017.	3. Fahim Farook, Matthijs Hollemans, ios Apprentice,7[th]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	
		Training Report	Presentation*
	Weightage	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:

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 :	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																			

Column headers (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. Level of Thinking (Bloom), Expected Proficiency (%), Expected Attainment (%).

Course Learning Outcomes (CLO): At the end of this course, learners will be able to:

		Lvl	Prof	Att		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
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			Program Learning Outcomes (PLO)

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
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																		

PLO column headers: 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. First three columns: 1 Level of Thinking (Bloom), 2 Expected Proficiency (%), 3 Expected Attainment (%).

Course Learning Outcomes (CLO): At the end of this course, learners will be able to:

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
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
2. Mr. Durga Prasad Bokka, TCS Chennai, durgaprasad@tcs.com	2. Ms. Subashree, VIT, Chennai, subashree@vit.ac.in	2. Ms. Cauveri B, SRMIST	4. Dr. M. M.Umamaheswari, SRMIST	

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

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

Course Learning Rationale (CLR): *The purpose of learning this course is to:*

		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 :	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																			

Column headers (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

Learning columns: 1 Level of Thinking (Bloom), 2 Expected Proficiency (%), 3 Expected Attainment (%)

Course Learning Outcomes (CLO): *At the end of this course, learners will be able to:*

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
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
2. Shri Shri Ravi Shankar, The Art of stress-free Living, 2011
3. Swami Ramdev Ji Yog Its Philosophy and Practice, 2008
4. Yogiraj Vethathiri Maharishi, Yoga for Modern Age, Tenth edition, Vethathiri Publications, 2007
5. Yogiraj Vethathiri Maharishi, Simplified Physical Exercises, Forty Second edition, Jan-2014 | 6. Vivekananda Kenthria Prkasan Trust, Yogam, 2006
7. Swami Chetanananda, Meditation and Its Methods According to Swami Vivekananda, Jan 2001
8. Dr.Lakshminarain Sharma, Yoga for the cure of Common Diseases, Mar 2016
9. Swami Satyananda Saraswati, Asana Pranayama Mudra Bandha, Bihar School of Yoga, 1993
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 Understand	-	40%	-	30%	-	30%	-	30%	-	-
Level 2	Apply Analyze	-	40%	-	40%	-	40%	-	40%	-	-
Level 3	Evaluate Create	-	20%	-	30%	-	30%	-	30%	-	-
	Total	100 %		100 %		100 %		100 %		-	

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

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Mr. K. Sivakumar, LIC of India, ksivalic1970@gmail.com	1. Dr. R. Elangovan, Tamilnadu Physical Education and SportsUniversity, relangovantnpesu@yahoo.co.in	1. Dr. V. Nithyananthan, SRMIST
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:
CLR-1 :	Connect the learners to their potential, identify their 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

Learning — Program Learning Outcomes (PLO)

		1	2	3		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)		Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Equipped with an awareness of their positive energy and power	2	80	75		L	M	-	-	M	M	-	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

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