

## B.Tech. in Computer Science and Engineering with Specialization in Internet of Things

### Mission of the Department

Mission Stmt - 1	<i>To impart knowledge in cutting edge Computer Science and Engineering technologies in par with industrial standards.</i>
Mission Stmt - 2	<i>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</i>
Mission Stmt - 3	<i>To demonstrate strong communication skills and possess the ability to design computing systems individually as well as part of a multidisciplinary teams.</i>
Mission Stmt - 4	<i>To instill societal, safety, cultural, environmental, and ethical responsibilities in all professional activities</i>
Mission Stmt - 5	<i>To produce successful Computer Science and Engineering graduates with personal and professional responsibilities and commitment to lifelong learning</i>

### Program Educational Objectives (PEO)

PEO - 1	<i>Graduates will be able to perform in technical/managerial roles ranging from design, development, problem solving to production support in software industries and R&amp;D sectors.</i>
PEO - 2	<i>Graduates will be able to successfully pursue higher education in reputed institutions.</i>
PEO - 3	<i>Graduates will have the ability to adapt, contribute and innovate new technologies and systems in the key domains of Computer Science and Engineering.</i>
PEO - 4	<i>Graduates will be ethically and socially responsible solution providers and entrepreneurs in Computer Science and other engineering disciplines.</i>
PEO - 5	<i>Graduates will possess skills to design computing systems based on IOT</i>
PEO - 6	<i>Graduates will have the ability to develop tools incorporating the skills acquired in IOT domain.</i>

### 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	L	H	H	H	H	H
PEO - 4	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
PEO - 5	H	L	L	H	H	L	L	L	L	L	H	H	H	H	H
PEO - 6	L	L	L	L	H	L	L	L	L	L	H	H	H	H	H

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

#### PSO – Program Specific Outcomes (PSO)

PSO - 1	<i>Ability to Utilize Hardware / Core CS Principles</i>
PSO - 2	<i>Ability to Create Software &amp; Programming</i>
PSO - 3	<i>Ability to Develop IOT based systems</i>

## Program Structure: B.Tech. in Computer Science and Engineering with Specialization in Internet of Things

1. Humanities & Social Sciences including Management Courses (H)						
Course Code	Course Title	Hours/ Week				C
		L	T	P	C	
18LEH101J	English	2	0	2	3	
18LEH102J	Chinese					
18LEH103J	French					
18LEH104J	German	2	0	2	3	
18LEH105J	Japanese					
18LEH106J	Korean					
18PDH101T	General Aptitude	0	0	2	1	
18PDH102T	Management Principles for Engineers	2	0	0	2	
18PDH103T	Social Engineering	2	0	0	2	
18PDH201T	Employability Skills & Practices	0	0	2	1	
<b>Total Learning Credits</b>						<b>12</b>

3. Engineering Science Courses (S)						
Course Code	Course Title	Hours/ Week				C
		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	
<b>Total Learning Credits</b>						<b>23</b>

5. Professional Elective Courses (E) (Any 6 Elective Courses)						
Course Code	Course Title	Hours/ Week				C
		L	T	P	C	
18CSE377T	Data Centric Networks	3	0	0	3	
18CSE345T	IOT Architecture and Protocols	3	0	0	3	
18CSE392T	Machine Learning-I	3	0	0	3	
18CSE388T	Artificial Neural Networks	3	0	0	3	
18CSE346T	Network Programming	3	0	0	3	
18CSE451T	Wireless Sensor Networks	3	0	0	3	
18CSE456T	Software Defined Networks	3	0	0	3	
18CSE445T	IOT Security	3	0	0	3	
18CSE458T	Wireless and Mobile Communication	3	0	0	3	
18CSE446T	Advanced Database Systems	3	0	0	3	
18CSE447T	Edge Computing	3	0	0	3	
18CSE448T	Energy Management for IOT devices	3	0	0	3	
18CSE490T	Big Data Visualization	3	0	0	3	
<b>Total Learning Credits</b>						<b>18</b>

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					
18PDM203L	Entrepreneurial Skill Development	0	0	2	0	
18PDM202L	Critical and Creative Thinking Skills	0	0	2	0	

2. Basic Science Courses (B)						
Course Code	Course Title	Hours/ Week				C
		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	
<b>Total Learning Credits</b>						<b>32</b>

4. Professional Core Courses (C)						
Course Code	Course Title	Hours/ Week				C
		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	
<b>Total Learning Credits</b>						<b>48</b>

6. Open Elective Courses (O)						
Course Code	Course Title	Hours/ Week				C
		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	
<b>Total Learning Credits</b>						<b>12</b>

7. Project Work, Seminar, Internship In Industry/ Higher Technical Institutions (P)						
Course Code	Course Title	Hours/ Week				C
		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	
<b>Total Learning Credits</b>						<b>15</b>

18PDM204L	Business Basics for Entrepreneurs					<b>8. Mandatory Courses (M)</b>									
18PDM301L	Analytical and Logical Thinking Skills	0	0	2	0	Course Code	Course Title	Hours/Week				C			
19PDM302L	Entrepreneurship Management							L	T	P					
18LEM101T	Constitution of India	1	0	0	0	18GNN102L	NSS	0	0	2	0				
18LEM102J	Value Education	1	0	1	0	18GNN103L	NCC								
18GNN101L	Physical and Mental Health using Yoga	0	0	2	0	18GNN104L	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 Internet of Things

Course Code	Course Name	Program Learning Outcomes (PLO)														
		Graduate Attributes											PSO			
		Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO - 3
18CSS101J	Programming for Problem Solving	H	H	M	M	H	L	L	M	H	M	L	H	L	H	H
18CSC201J	Data Structures and Algorithms	H	H	H	H	M	L	L	M	H	M	M	H	L	H	H
18CSC202J	Object Oriented Design and Programming	H	H	H	H	M	L	M	H	H	M	H	L	H	H	H
18CSC203J	Computer Organization and Architecture	H	M	H	M	L	L	L	M	L	L	M	H	M	M	
18CSC204J	Design and Analysis of Algorithms	H	H	H	H	M	M	L	M	M	M	H	L	H	H	
18CSC205J	Operating Systems	H	H	H	H	M	L	M	H	M	M	H	H	M	M	
18CSC206J	Software Engineering and Project Management	H	H	H	H	H	H	H	H	H	H	H	L	H	M	
18CSC207J	Advanced Programming Practice	H	H	M	M	H	L	L	M	H	M	L	H	L	H	H
18CSC301T	Formal Language and Automata	H	H	H	H	L	L	L	L	M	M	L	H	H	H	H
18CSC302J	Computer Networks	H	H	H	H	M	L	M	H	M	M	H	H	M	M	
18CSC303J	Database Management Systems	H	H	H	H	M	L	M	H	M	M	H	H	H	M	
18CSC304J	Compiler Design	H	H	H	H	M	L	L	L	M	M	L	H	H	H	H
18CSC305J	Artificial Intelligence	H	H	H	H	M	M	L	L	M	M	L	H	H	H	H
18CSE377T	Data Centric Networks	H	H	H	H	M	M	M	H	H	M	H	H	H	H	
18CSE345T	IOT Architecture and Protocols	H	H	H	H	M	H	H	M	H	H	M	H	H	H	
18CSE392T	Machine Learning-I	H	H	H	M	H	M	L	M	H	M	L	H	L	H	H
18CSE388T	Artificial Neural Networks	H	H	H	M	H	M	L	M	H	M	L	H	L	H	H
18CSE346T	Network Programming	H	H	H	H	M	M	M	M	H	H	H	H	H	H	
18CSE451T	Wireless Sensor Networks	H	H	H	H	M	M	M	M	M	H	L	H	H	H	H
18CSE456T	Software Defined Networks	H	H	H	H	M	M	M	M	H	M	H	H	H	H	
18CSE445T	IOT Security	H	H	H	H	M	M	M	H	H	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
18CSE446T	Advanced Database Systems	H	H	H	H	H	H	H	H	H	H	H	H	H	H	
18CSE447T	Edge Computing	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
18CSE448T	Energy Management for IOT devices	H	H	H	H	H	H	H	H	M	H	M	H	H	H	H
18CSE490T	Big Data Visualization	M	H	H	H	H	M	M	H	H	H	H	H	M	H	H
18CSP101L	MOOC / Industrial Training / Seminar - 1	H	M	M	M	M	M	M	M	H	H	H	M	H	H	H
18CSP102L	MOOC / Industrial Training / Seminar - 2	H	M	M	M	M	M	M	M	H	H	H	M	H	H	H
18CSP103L	Project (Phase-I) / Internship (4-6 weeks)	H	H	H	H	H	M	M	H	H	H	H	H	M	M	
18CSP104L	Project (Phase-II) / Semester Internship	H	H	H	H	H	M	M	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 Internet of Things

Semester - I					
Code	Course Title	Hours/ Week			C
		L	T	P	
18LEH101J	English	2	0	2	3
18MAB101T	Calculus and Linear Algebra	3	1	0	4
18PYB103J	Physics: Semiconductor Physics	3	1	2	5
18MES101L	Engineering Graphics and Design	1	0	4	3
18EES101J	Basic Electrical and Electronics Engineering	3	1	2	5
18PDM101L	Professional Skills and Practices	0	0	2	0
18LEM101T	Constitution of India	1	0	0	0
18GNM101L	Physical and Mental Health using Yoga	0	0	2	0
Total Learning Credits					20

  

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

  

Semester - III					
Code	Course Title	Hours/ Week			C
		L	T	P	
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	0	0	2	0
Total Learning Credits					24

  

Semester - IV					
Code	Course Title	Hours/ Week			C
		L	T	P	
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	0	0	2	0
18CYM101T	Environmental Science	1	0	0	0
Total Learning Credits					25

  

Semester - V					
Code	Course Title	Hours/ Week			C
		L	T	P	
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	0	0	2	0
18LEM109T	Indian Traditional Knowledge	1	0	0	0
Total Learning Credits					24

  

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

  

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

  

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

**BTECH (CSE)**  
**SPECIALIZATION IN INTERNET OF THINGS**  
**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)
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CLR-1:	Analyze the importance of communication in personal, professional contexts. Identify proper English pronunciation	1	2	3		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2:	Strengthen vocabulary and grammar. Enhance listening and writing comprehension. Review films and documentaries	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-3:	Writing brief paragraphs using appropriate techniques. Enhance their English fluency in speaking																			
CLR-4:	Write effective essays, stories. Experience workplace communication aspects																			
CLR-5:	Research on a topic and write a comprehensible academic project reports. Make effective presentations																			
CLR-6:	Utilize English language skills along with technical skills in build wider career orientations																			
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																			
CLO-1:	Identify types, modes, channels and barriers of communication.distinguish different speech sounds, pronounce correctly	1	7	6		L	H	L	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	6	6		L	H	L	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	7	7		L	H	L	H	H	M	L	H	H	-	H	-	-	-	
CLO-4:	Develop ideas into logical and coherent essays. Understand better the workplace culture	3	7	6		L	H	L	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	7	6		L	H	L	H	H	L	H	H	H	-	H	-	-	-	
CLO-6:	Build listening, speaking, reading, writing abilities in English, To interact with English speaking people.	3	7	6		L	L	L	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
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Learning Assessment											
Level of Thinking	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#		Theory	Practice
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice		
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

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

Course Designers				
Experts from Industry	Experts from Higher Technical Institutions		Internal Experts	
1. Dr. Usha Kodandaraman, ABK AOTS, Chennai.	1. Dr. S. P. Dhanavel, IITM, Chennai,		1. Dr. K. Anbazhagan,	3. Dr. Sukanya Saha, SRMIST
				5. S. Ramya,



<i>drushak@gmail.com</i>	<i>dhanavelsp@itm.ac.in</i>	<i>SRMIST</i>	<i>SRMIST</i>
<i>2. Mr. Durga Prasad Bokka, TCS Chennai, durgaprasad@tcs.com</i>	<i>2. Ms. Subashree, VIT, Chennai, subashree@vit.ac.in</i>	<i>2. Ms. Cauveri B, SRMIST</i>	<i>4. Dr. M. M.Umamaheswari, SRMIST</i>

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)
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CLR-1:	CLR-2:	CLR-3:	CLR-4:	CLR-5:	CLR-6:	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		
Pronounce Chinese Romanization, know about China and Chinese speaking countries, Read basic Chinese characters	Help ask about the need, counting numbers, Greet each other, express time and date in daily conversations	Ask about directions, learn basic conversation on orientation	Daily activities and asking about places and Chinese etiquette	List the Chinese festivals and Chinese culture, acquire basic conversational skills	Utilize Chinese language skills along with technical skills in build wider career orientations																		
Course Learning Outcomes (CLO):		At the end of this course, learners will be able to:																					
CLO-1:	Pronounce Chinese language, Identify the basic Chinese scripts, tones and greetings	1	6	6	0	0			-	-	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	6	6	5	2			-	-	H	-	H	M	L	M	H	M	-	H	-	-	-
CLO-3:	Ask different kinds of questions, to tell age using Chinese words	2	6	6	8	3			-	-	M	-	M	L	L	M	L	M	-	H	-	-	-
CLO-4:	Identify the different usage of Chinese grammar and vocabulary and introduce one self	2	6	6	9	5			-	-	H	-	H	H	L	M	H	H	-	H	-	-	-
CLO-5:	Appropriately use different verbs and adjectives in basic conversations	2	7	6	2	3			-	-	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	7	6	0	0			-	-	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 WH 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 frequently used 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	Pronunciation 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	Pronunciation of Pinyin chart	Converting numbers	Lianxi	Lianxi	Lianxi
S-5	SLO-1	Introduction of Four Tones in Chinese language.	Time & time related greetings,	Politely and formally asking names ,Expressing apology.	Making Chinese sentences with verbal & Adjectival predicate.	Grammar related to 但是, 可是, 以前, 以后, 后来。

	SLO-2	Four Tones and related pronunciation.	Days&Seasons.	Introduction & Application of verbal Measure Word.	Introduction of 地	Introduction & Application of the basic optative verbs like 会, 能, 可以.
S-6	SLO-1	Tonesandhi (一, 不) in Chinese Tone discrimination in Chinese	Sentence patterns in Chinese, S-V-O sentences.Framing simple sentences.	Make sentences with在,and few corelated words like 这儿, 那儿 with example	Few basic verbs and adjectives.	conversation how todescribe likes ,dislikes, interest and hobbies
	SLO-2	Chinese characters. The eight strokes of characters, proper stoke orders.	Introduce 是 and 不是	Important locations used in daily life.	Opposite words.	Conduct conversation how todescribe likes, dislikes.,interest and hobbies
S-7	SLO-1	Pronounce word in proper tone	Vocabulary	Asking about places.	Usage of verbs	Usage of grammar
	SLO-2	Personal Pronouns and relations, Plural forms of pronouns	Asking date and time	lianxi	练习	lianxi
S-8	SLO-1	Writing characters with proper stroke order	Usage of time words in a sentence	Asking about directions.	Usage of adjectives with different adverbs	Asking about interest and hobbies
	SLO-2	Writing characters with proper stroke order	Introducing each other	lianxi	练习	lianxi
S-9	SLO-1	Sentence structure with the adjective 很and Framing sentences, negative of 很。	Weekdays in Chinese, Month, Year&Writing Date.	Profession relatedvocabulary, application withexamples.	Colour and vocabulary, application withexamples.	Conversation how to bergain and purchase products.
	SLO-2	Introduction of adverb 也, Interrogative particle呢, application & Usages.	Introduction of verb有 and it'snegative form .Nominal measure word.	Basic conversation about persons occupation	describe family members and talk about university and department	conversation how to bergain and purchase products.
S-10	SLO-1	Possesive/ Structural Particle的, application of 的with pronouns.	Framing of basic interrogative sentences with modal particle吗。	Introduction of interrogative phrase 多大, Tellingone'sage in Chinese.	Sports &Gamesrealatedvocabulary, special usages,	Use of conjugation 还是, 或者with example.
	SLO-2	Writing Chinese characters basic conversation related to greetings	Framing of basic interrogative sentences with modal particle吗。	Introduction of past tense and aspect particle了。	application withexamples.	
S-11	SLO-1	Writing greetings in characters with proper stoke order	Asking simple question	Asking age	Asking about likes and dislikes	Asking about purchasing products
	SLO-2	练习	Asking date	lianxi	Asking about likes and dislikes	Asking about purchasing products
S-12	SLO-1	Basic Expression	Birthday in Chinese	Asking about occupation	Asking about family members	Usage of conjugation
	SLO-2	练习	Grammar – has, have	lianxi	Asking about family members	Usage of conjugation

<b>Learning Resources</b>	1. Liu Xun, New Practical Chinese reader, Beijing Language and Culture University Press, 2008	2. Elementary Chinese Reader- 1, Sinolingua Beijing China, 2007
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Learning Assessment											
Level of Thinking	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#		Theory	Practice
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice		
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

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Course 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)
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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																		
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 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 à 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 goûts 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 à 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	<i>Les pays, les couleurs</i>	<i>Le genre des adjectifs</i>	<i>Les verbes pronominaux(1)</i>	<i>Les adverbes de fréquence</i>	<i>Les articles partitifs</i>
	SLO-2	<i>Des portraits de pays francophones</i>	<i>les nombre des adjectifs</i>	<i>Les verbes pronominaux(1)</i>	<i>Les adverbes de temps</i>	<i>Les exp. De quantités</i>
S-7	SLO-1	<i>Présentez- vous</i>	<i>Les vocabulaires des objets</i>	<i>Parler de ses loisirs</i>	<i>Décrire une tenue</i>	<i>Accepter une invitation</i>
	SLO-2	<i>Présenter qqn</i>	<i>Décrire son voisin</i>	<i>Exprimer ses goûts</i>	<i>Décrire les accessoires</i>	<i>refuser une invitation</i>
S-8	SLO-1	<i>S'informer sur qqn</i>	<i>Décrire votre profession</i>	<i>Exprimer une préférence</i>	<i>Parler qqc</i>	<i>Donner son appréciation</i>
	SLO-2	<i>Demander des informations personnelles</i>	<i>La langue, activité recap.</i>	<i>Exprimer une envie, Activité quotidienne</i>	<i>justifier</i>	<i>S'exprimer a table</i>
S-9	SLO-1	<i>Les prépositions de lieu (1)</i>	<i>Les adjectifs possessifs (sing)</i>	<i>Le verbe aller</i>	<i>Le passe compose : avoir</i>	<i>Le pronom « en » de quantité</i>
	SLO-2	<i>Les verbes : parler, habiter</i>	<i>Les adjectifs possessifs (pl)</i>	<i>Le futur proche</i>	<i>Le passe compose : etre</i>	<i>Il faut</i>
S-10	SLO-1	<i>Les articles définis</i>	<i>Les prépositions de lieu(2)</i>	<i>L'heure</i>	<i>L'imparfait (1)</i>	<i>Les festivals du mot</i>
	SLO-2	<i>Les pronoms Personnelles</i>	<i>Les orientations</i>	<i>Les Temps</i>	<i>L'imparfait (2)</i>	<i>Les festivals en France</i>
S-11	SLO-1	<i>Demander poliment</i>	<i>Les pièces, l'équipement</i>	<i>Demander l'heure</i>	<i>Parler d'un film</i>	<i>Donner des instructions (il Faut)</i>
	SLO-2	<i>Répondre poliment</i>	<i>S'informer un logement</i>	<i>Dire l'heure</i>	<i>Féliciter un souhait</i>	<i>Cuisine d'une parisienne d'adoption</i>
S-12	SLO-1	<i>Les vocabulaires d'informatique</i>	<i>Ecrire un portrait</i>	<i>Raconter sa vie sur un blog</i>	<i>Adresser un souhait</i>	<i>Commander au restaurant</i>
	SLO-2	<i>S'inscrire sur un site</i>	<i>La description physique</i>	<i>Justifier</i>	<i>Ecrire une carte postale</i>	<i>Ecrire une recette</i>

Learning Resources	1. SAISONS 1 – Didier - 2017	2. BIENVENUE – Course Book in French – Department of EFL, SRMIST- 2017
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Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#		Theory	Practice
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice		
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

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Course Designers			
Experts from Industry		Experts from Higher Technical Institutions	
1. Mr.D.Hemachandran, Renault Nissan, Senior Language Specialist		1. Dr. S. P. Dhanavel, IIT Madras, dhanavelsp@iitm.ac.in	
2. Mr. Durga Prasad Bokka, TCS Chennai, durgaprasad@tcs.com		2. Ms. Judy Niranjala, SIET college for Women, Chennai	
		Internal Experts	
		1. Dr. K. Anbazhagan, SRMIST	2. Ms. K. Sankari, SRMIST
		3. Mr. J. Sabastian Satish, SRMIST	



	SLO-2	Hören und buchstabieren.	Nachdem Wegfragen und einem Wegbeschreiben	Gespräche beim Einkauf führen.	Sich für eine verspätung entschuldigen.	Personal pronomen und beispiele Sätze.
S-6	SLO-1	Aussagesatz und personal pronomen in Nominativ und beispiele Sätze.	Texte mit internationalen wörtern verstehen.	Gespräche beim Essen führen.	Einen Termin telefonisch vereinbaren.	Im Restaurant bestellen und bezahlen, überein Ereignis sprechen,
	SLO-2	Über Arbeit, Berufe und Arbeitszeiten sprechen.	Artikel lernen.	W-Fragen Texte verstehen.	Schreiben Sie die Uhrzeiten.	Bestimmt Informationen in Texten finden.
S-7	SLO-1	Übersich und andersprechen.	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 andere vorstellen.	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 Jahrezzeiten 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 Kurze Vokale.	Schreiben Sie die Sätze.	Zeitangaben mit am, um, von.... bis.	Beispiele Sätze.
S-10	SLO-1	Bestimmt Artikel in Nominativ.	Regelmäßige verben Konjugationen.	Positionen im Satz, Bestimmt Artikel im Akkusativ.	Erklärt die Grammatik Präpositionen im Akkusativ.	Präteritum von Hilfsverben und konjugationen.
	SLO-2	Verwendungen von Hilfsverben.	Satzschreiben.	Akkusativ Verben konjugationen.	Beispiele Sätze im Präpositionen .	Modal verben konjugationen und beispiele Sätze.
S-11	SLO-1	Ja oder Nein Fragen durch PPT.	Der Imperativsätze und auch die Regelmäßige verben	Essen im D-A-CH, Beruf und 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 Tagesablauf.	W-Frage und Trennbare verben.
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 deine Familie.	Claudia Berg in der Arbeit.	Einkaufen planen.	Der Termin und die Verabredung.	Schreiben Sie die Sätze mit Hilfs verben.

<b>Learning Resources</b>	1. Netzwerk – Klett – Langenscheidt, München, 2015	2. Grundkurs Deutsch, Dept. of EFL, SRMIST
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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
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Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

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

Course Designers			
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts	
1. Dr. Usha Kodandaraman, ABK AOTS, Chennai. drushak@gmail.com	1. Dr. S. P. Dhanavel, IIT Madras, dhanavelsp@iitm.ac.in	1. Dr. K. Anbazhagan, SRMIST	2. Dr. P. Tamilarasan, SRMIST
2. Mr. Vivek Raghunathan, Health care, vivek.raghunathan@waikato.dhb.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)
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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																		
CLR-4:	Create daily activities and tell time. Appreciate Japan etiquette. Conjugate a reflexive verb and 3 <sup>rd</sup> 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:	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, 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 2 <sup>nd</sup> 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
	SLO-2	Japanese language and culture	ma/ya series related words	Japanese sports.	Religious beliefs,.
S-2	SLO-1	Greetings	Lesson 3 – time - reading	Japanese martial arts.	Lesson 7 – reading and grammar
	SLO-2	Self Introduction	Lesson 3 grammar. Classroom expressions. Kara, made, ni, ne and o	De and to	Ongaku and manga
S-3	SLO-1	Hiragana Lesson 1 (vowels and related words)	Hiragana Lesson 8 Ra/Wa series	Kanji	Common expressions
	SLO-2	Lesson 1– reading. Self introduction	Ra/Wa series related words	iku, miru, yasumu and kau	Body parts (vocabulary).
S-4	SLO-1	Lesson 1 grammar (wa,ka,mo,no,desu/ja arimasen)	Lesson 3 – renshuu and exercises	<b>Revision of complete Hiragana</b>	Explanation of past tense of verbs.
	SLO-2	Days of the week	Family. Festivals of Japan. Omiyage	<b>Revision of all Particles</b>	Kanji – kuchi, ame, hairimasu, kirimasu, ji, han and fun
S-5	SLO-1	Hiragana Lesson 2	Hiragana Lesson 9	<b>Assignment</b>	Lesson 7 reading.
	SLO-2	ka and ga series and related words	Double consonants and related words	<b>Assignment</b>	Lesson 7 exercises



S-6	SLO-1	Lesson 1 – renshuu	Lesson 4 – reading, grammar and vocabulary	<b>Surprise Test</b>	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	<b>Surprise Test</b>	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	<b>Particles</b>	Explanation of mashou	Transport
S-9	SLO-1	Hiragana Lessons 4 and 5	Hashi	Katakana – introduction	Lesson 8 – renshuu.	Review of particles
	SLO-2	ta/da and na/ha series and related words	Hiragana Lesson 11 (chart 3 and related words).	Katakana – rules	Value your time	Review of Kana and Kanji
S-10	SLO-1	Kore.../kono...-reading, grammar and vocabulary	Counters explanation	Review of lessons 1-5	Kanji - days of the week	Review of verbs and adjectives
	SLO-2	Ni and ga, arimasu/imasu, Dare/donata. Renshuu and Meishi	Kanji – days of the week	Grammar and vocabulary	Japanese food and	Japanese house and living style
S-11	SLO-1	Hiragana Lesson 6 (ba/pa series).	Hiragana – special words like wa, e and o and sentence reading	Katakana vocabulary	Lesson 9 reading	Japanese tea ceremony
	SLO-2	Lesson 2 – exercises. Introduction to time.	Lesson 5 – reading.	Kanji – ikimasu, mimasu, yasumimasu	Lesson 9 grammar	Japanese Religious beliefs.
S-12	SLO-1	Kanji numbers – 13. Time expressions	Lesson 5 Grammar.	Lesson 6 – reading and grammar	Stationery	Japanese Economy
	SLO-2	Colours and basic 5 kanjis (ue, shita, naka, yama and kawa)	Lesson 5 Vocabulary.	Visiting a Japanese home	Transport (vocabulary)	Calligraphy

<b>Learning Resources</b>	1. Minna no Nihon Go, 3A Corporation, Tokyo, Japan, 2002	2. A Basic Course in Japanese – Department of EFL, SRMIST, 2017
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Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#		Theory	Practice
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice		
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

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

<b>Course Designers</b>			
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1. Dr. Usha Kodandaraman, ABK AOTS, Chennai. drushak@gmail.com	1. Dr. S. P. Dhanavel, IIT Madras, dhanavelsp@iitm.ac.in		1. Ms. R. Padmajaa, SRMIST
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)
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CLR-1:	CLR-2:	CLR-3:	CLR-4:	CLR-5:	CLR-6:	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		
Know about Korea and its culture; to be able to read, write the Korean script, and to introduce oneself and other people	Manage daily life living in Korea. Talking daily activities. Asking for and giving directions, describing the location	Be able to shop by asking for the availability of things, and learning about the currency system	Tell time, to socialize: make appointments, talk about weekend plans/activities	Communicate about studying Korean and about future career or academic plans	Utilize Korean language skills along with technical skills in build wider career orientations	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:																	
CLO-1:	Read, pronounce and write the Korean script, Introduce oneself and other people. Get to know about Korea and its culture	1	7	6	0	0	-	-	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	6	6	5	5	-	-	L	-	H	M	L	M	H	H	-	H	-	-	-		
CLO-3:	Talk about past activities (past tense), the weather and use the Korean currency	2	6	6	5	5	-	-	L	-	M	H	L	M	M	M	-	H	-	-	-		
CLO-4:	Tell time, to socialize: make appointments, talk about weekend plans/activities	3	7	6	5	5	-	-	L	-	H	H	L	M	H	H	-	H	-	-	-		
CLO-5:	Communicate about studying Korean and about future career or academic plans	3	7	6	5	5	-	-	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	7	6	5	5	-	-	L	-	H	H	L	M	H	H	-	H	-	-	-		

Duration (hour)	12	12	12	12	12
S-1	SLO-1 Introduction to Korea and Korean - SLO-2 한글소개, 한국소개	2. 일상생활daily life, new vocab (action, places)	listening & key sentences drilling reading/writing	dialogue1& dialogue2 practice	grammar point 1-그 래서 grammar point1-(으)르거예요
S-2	SLO-1 single vowels (단모음) SLO-2	grammar point1-아.요/ 어.요&grammar point2-에 가다	5. 쇼핑2 shopping2 new vocab (counter noun)	listening & key sentences drilling reading/writing	dialogue1& dialogue2 practice
S-3	SLO-1 이중모음과자음 double vowels & basic consonants SLO-2	dialogue1& dialogue2 practice	grammar point1-버 니다/습 니다, 버 니까/습 니까&	8. 시간 time new vocab (time)	listening & reading
S-4	SLO-1 쌍자음과음절double consonants & syllables SLO-2	listening & reading/writing	teaching money	Teaching date & weeks	writing for weekend activities
S-5	SLO-1 받침과음절1 Batchim & syllables SLO-2	3. 위치/location new vocab(object /location)	dialogue1& dialogue2practice	grammar point1-에 grammar point2-사.분	11. 한국어 공부(studying Korean) new vocab(pronouns)
S-6	SLO-1 받침과음절2 Batchim & syllables SLO-2	grammar point1-이/가 grammar point2-에 있다/없다	listening & key sentences drilling reading/writing	dialogue1& dialogue2practice	grammar point1- 내/저, 내/제 grammar point2-'ㄷ' irregular verbs
S-7	SLO-1 자모연습. (practices vowels and consonants) SLO-2	dialogue1& dialogue2practice	6. 어제 일과yesterday's daily routine new vocab (action, places)	listening & key sentences drilling reading/writing	dialogue1& dialogue2 practice
S-8	SLO-1 듣기. 교실표현( listening & class terms)	listening & key sentences drilling	grammar point1-있었	9. 약속 appointment new vocab(location& plan	listening & key sentences drilling

	SLO-2		reading/writing	grammar point2-에/서		reading/writing
S-9	SLO-1	1.자기소개 self-introduction, new vocab(nationality, occupation)	4.쇼핑 shopping  new vocab (items to shop)	dialogue1& dialogue2 practice	grammar point1- (으)르/까요	12.계획(plan) -(으)르/거예요.
	SLO-2				grammar point2-아/요/어/어요	
S-10	SLO-1	grammar point1-이/에/요/이/예요	shopping teaching numbers	listening & key sentences drilling	dialogue1& dialogue2 practice	grammar point1- pro nouns 이/그/저 + 것(things)
	SLO-2	grammar point2-은/는		reading/writing		grammar point2- 'ㅡ' irregular verbs & dialogue2
S-11	SLO-1	dialogue1& dialogue2 practice	grammar point1-을/를	7.날씨  weather new vocab( season& weather)	listening & key sentences drilling	dialogue1& dialogue2 practice
	SLO-2		grammar point2-(으)세요		reading/writing	
S-12	SLO-1	listening & key sentences drilling	dialogue1& dialogue2 practice	grammar point1- 그리고	10. 주말활동 (weekend activities) new vocab (places& weekend activities)	listening & key sentences drilling
	SLO-2	reading/writing		grammar point2-안		reading/writing

<b>Learning Resources</b>	1. Sejong Korean 1, The National Institute of the Korean Language. Hawoo Publisher, 2013
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Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA - 1 (10%)		CLA - 2 (15%)		CLA - 3 (15%)		CLA - 4 (10%)#		Theory	Practice
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice		
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100%		100%		100%		100%		100%	

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

<b>Course Designers</b>		
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. Jang kyung A, SRMIST
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)
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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, <i>The Pearson Guide to Quantitative Aptitude and Data Interpretation for the CAT</i>	5. Norman Lewis, <i>How to Read Better and Faster</i> , Goyal, 4 <sup>th</sup> Edition
	2. Dinesh Khattar- <i>The Pearson Guide to QUANTITATIVE APTITUDE for competitive examinations</i>	6. Franklin GRE Word List, 3861 GRE Words, Franklin Vocab System, 2014 Wiley's GMAT Reading Comprehension Grail, Wiley, 2016
	3. Charles Harrington Elster, <i>Verbal Advantage: Ten Easy Steps to a Powerful Vocabulary</i> , Random House Reference, 2002	7. Manhattan Prep GRE : <i>Reading Comprehension and Essays</i> , 5th Edition
	4. Merriam Webster's <i>Vocabulary Builder</i> , Merriam Webster Mass Market, 2010	8. Martin Hewings, <i>Advanced Grammar in Use</i> . Cambridge University Press, 2013

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

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1. Mr. Pratap Iyer, Study Abroad Mentors, pratap.iyer30@gmail.com	1. Mr Nishith Sinha, dueNorth India Academics LLP, nsinha.alexander@gmail.com	1. Dr. P. Madhusoodhanan, SRMIST	2. Dr. M. Snehalatha, SRMIST
2. Mr Ajay Zenner, Career Launcher, ajay.z@careerlauncher.com	2. Dr.Dinesh Khattar, Delhi University, dinesh.khattar31@gmail.com	3. Mr Jayapragash J, SRMIST	4. Mrs. Rukmani, SRMIST

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

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1:	Acquire knowledge about the fundamental concepts of organization and management																		
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	Precautions 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				

	<b>SLO-2</b>	<i>Internal and External Factors</i>	<i>Putting It Together: Planning and Mission</i>	<i>Contingencies</i>	<i>Overcoming Hindrances</i>	<i>Cultural Issues</i>
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<b>Learning Resources</b>	9. Schermerhorn, J.R., <i>Introduction to Management</i> , 13 <sup>th</sup> ed., Wiley, 2017	11. Stephen Robbins, Mary Coulter, <i>Fundamentals of Management</i> , 9 <sup>th</sup> ed., Pearson Education, 2016
	10. Harold Koontz, Heinz Weihrich, <i>Essentials of management: An International &amp; Leadership Perspective</i> , 10 <sup>th</sup> ed., Tata McGraw -Hill Education, 2015	12. Samuel C. Certo, Tervis Certo, <i>Modern management: concepts and skills</i> , 12 <sup>th</sup> ed., Pearson, 2012 13. Charles W. L. Hill, Steven Mcshane, <i>Principles of Management</i> McGraw Hill Education, 2017

<b>Learning Assessment</b>											
	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.,

<b>Course Designers</b>		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Mr. Pratap Iyer, Study Abroad Mentors, Mumbai, pratap.iyer30@gmail.com	1. Dr. A.K. Sheik Manzoor, Anna University, sheikmanzoor@annauniv.edu	1. Mr. Mohamed Ibrahim. A. U., SRMIST
2. Mr. Ajay Zenner, Career Launcher, ajay.z@careerlauncher.com	2. Dr. Devamainthan, University of Madras	2. Mr. Muthu Manivannan, SRMIST

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

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

Course Learning Rationale (CLR):		The purpose of learning this course is to:	Learning			Program Learning Outcomes (PLO)															
Course Learning Outcomes (CLO):		At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
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																				
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



	<b>SLO-2</b>	Case study	Types of NGO	<b>Government Policies on CSR</b>	<b>Business Plan</b>	Report Analysis
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<b>Learning Resources</b>	1. Joel Makeower, <i>Beyond The Bottom Line: Putting Social Responsibility to work for your Business and the World</i> , Oct, 1995	5. Nicholls, Alex, ed., <i>Social Entrepreneurship – New Models of Sustainable Social Change</i> , Oxford University Press, 2008
	2. Simen Sinek, <i>Start with Why, How great leaders Inspire Everyone to Take Action</i> , Penguin UK, 2011	
	3. Adam Grant, <i>Give and Take: Why Helping others drives our success</i> , Orion Publishing Group, 2014	7. Robert A. Rohm, <i>Positive Personality Profiles</i> , Personality Insights, Inc, 2006
	4. David Bornstien, <i>How to change the world</i> , Oxford University Press, 2007	

<b>Learning Assessment</b>											
	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.,

<b>Course Designers</b>		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Mr. Vijay Nair – Director, Education Matters, vijayn@edmat.org	1. Dr. A.K. Sheik Manzoor, Anna University, sheikmanzoor@annauniv.edu	Mrs. Kavitha Srisaran, SRMIST
2. Mr. Ajay Zenner, Career Launcher, ajay.z@careerlauncher.com	2. Dr Vanitha. J., Loyola College, vanithaj@loyolacollege.edu	Mr. Priyanand P., SRMIST

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

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)
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CLR-1:	Introduce band gap and fermi level in semiconductors	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2:	Explain the concept of carrier transport mechanism in p-n and metal semiconductor junction	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:	Provide an insight on semiconductor optical transitions and photovoltaic effect																		
CLR-4:	Procure knowledge of electrical and optical measurements in semiconductor																		
CLR-5:	Develop necessary skills for low dimensional semiconductor material processing and characterization																		
CLR-6:	Utilize the concepts in physics for the understanding of engineering and technology																		
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																		
CLO-1:	Identify the energy band in solids and electron occupation probability	2	8	7	H	H	-	-	-	-	-	-	-	-	-	-	-	-	
CLO-2:	Analyze the working of optoelectronic devices	2	7	7	H	H	-	-	-	-	-	-	-	-	-	-	-	-	
CLO-3:	Apply the knowledge to the development of new and novel optoelectronic devices	2	8	7	H	-	-	H	-	-	-	-	-	-	-	-	-	-	
CLO-4:	Identify the working mechanism of electrical and optical measurements	2	7	7	H	H	-	-	-	-	-	-	-	-	-	-	-	-	
CLO-5:	Utilize the knowledge of the low dimensional semiconductor material fabrication and characterization.	2	8	7	H	-	H	-	-	-	-	-	-	-	-	-	-	-	
CLO-6:	Apply the concepts of semiconductor physics in real time applications	2	8	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

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
	SLO-2	Quantum Free electron theory	Fermi level on carrier-concentration and temperature in Intrinsic semiconductor	optical absorption process	Two-point probe technique
S-2	SLO-1	Density of states	Extrinsic semiconductors	Concept of recombination process	Four-point probe technique-linear method
	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
S-3	SLO-1	Kronig-Penney model	Explanation for carrier generation	Explanation for spontaneous emission	Significance of carrier density
	SLO-2	Kronig-Penney model	Explanation for recombination processes	Explanation for stimulated emission	Significance of resistivity and Hall mobility
S-4	SLO-1	Solving problems	Solving problem	Solving problem	Solving problem
	SLO-2	Solving problems	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 of Semiconductor Laser
	SLO-2	E-k diagram	Carrier transport - diffusion and drift current	Joint density of states in semiconductor	Hot-point probe measurement
S-7	SLO-2	Direct and Indirect band gap	Continuity equation	Density of states for photons	capacitance-voltage measurements

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	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
	SLO-2					
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	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
	SLO-2					

Learning Resources	1. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc. 1995.	3. S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley 2008.
	2. B. E. A. Saleh and M. C. Teich, Fundamentals of Photonics, John Wiley & Sons, Inc., 2007.	4. A. Yariv and P. Yeh, Photonics: Optical Electronics in Modern Communications, Oxford University Press, New York 2007.

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

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

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr. Vinay Gupta, National Physical Laboratory, guptavinay@nplindia.org	Prof. C.Vijayan, IITM, Chennai, cvijayan@iitm.ac.in	Dr.C. Preferencial Kala, SRMIST
	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)
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CLR-1:	Utilize the atomic and molecular manipulation towards the design of new materials	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2:	Employ various spectroscopic techniques in identifying the structure and correlate it with their properties																		
CLR-3:	Exploit the periodic properties of elements for bulk property manipulation towards technological advancement																		
CLR-4:	Address concepts related to electrochemistry, such as corrosion, using thermodynamic principles																		
CLR-5:	Employ various organic reactions towards the design of fine chemical and drug molecules for industries																		
CLR-6:	Utilize the basic chemistry principles applied in various engineering problems and identify appropriate solutions																		
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	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:	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
	SLO-2	Schrodinger equation-Derivation	Crystal field theory-Explanation	surface characterization techniques – XPS - Explanation	Hard soft acids and bases
S-2	SLO-1	Particle in a box solutions	Energy level diagrams for transition metal ions	Diffraction and scattering of solids	Thermodynamic functions: energy
	SLO-2	Applications for conjugated molecules	Energy level diagrams for transition metal ions	Explanation	Entropy and free energy
S-3	SLO-1	Forms of the hydrogen atom wave functions	Magnetic properties of transition compounds	Ionic, dipolar interactions	Estimation of entropy
	SLO-2	plots of these functions to explore their spatial variations	Magnetic properties of transition compounds	Van der Waals interactions	Estimation of free energies.
S-4	SLO-1	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session
	SLO-2	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session
S-5-6	SLO-1	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
	SLO-2				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
	SLO-2	Heteronuclear diatomic molecules	Principles of spectroscopy-Explanation	critical phenomena	The Nernst equation and applications
S-8	SLO-1	Equations for atomic orbitals	Selection rules-Introduction	Effective nuclear charge, penetration of orbitals	Acid base, oxidation reduction

	<b>SLO-2</b>	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
<b>S-9</b>	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
<b>S-10</b>	SLO-1	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session
	SLO-2	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session
<b>S 11-12</b>	SLO-1	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	<b>Experiment - Repeat - 3</b>
	SLO-2					
<b>S-13</b>	SLO-1	$\pi$ -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	$\pi$ -molecular orbitals of benzene	Rotational spectroscopy of diatomic molecules	ionization energies, electron affinity and electronegativity	Corrosion	Synthesis of a commonly used drug molecule-Examples
<b>S-14</b>	SLO-1	Aromaticity-Introduction	Vibrational spectroscopy of diatomic molecules.	Polarizability, oxidation states	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, oxidation states	structural isomers and stereoisomers	Synthesis of a commonly used drug molecule-Examples
<b>S-15</b>	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
<b>S-16</b>	SLO-1	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session
	SLO-2	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session	Tutorial Session
<b>S 17-18</b>	SLO-1	Determine hardness ( $\text{Ca}^{2+}$ ) of water using EDTA – complexometry method	Determine strength of an acid by conductometry	Determine molecular weight of a polymer by viscosity average method	<b>Experiment - Repeat - 1</b>	Demonstration Practical Session
	SLO-2					

<b>Learning Resources</b>	1. B. H. Mahan, R. J. Meyers, University Chemistry, 4 <sup>th</sup> ed., Pearson publishers, 2009.	4.B. L. Tembe, Kamaluddin, M. S. Krishnan, Engineering Chemistry (NPTEL Web-book) <a href="http://nptel.ac.in/downloads/122101001/">http://nptel.ac.in/downloads/122101001/</a>
	2. M. J. Sienko, R. A. Plane, Chemistry: Principles and Applications, 3 <sup>rd</sup> ed., McGraw-Hill publishers, 1980	
	3. C. N. Banwell, Fundamentals of Molecular Spectroscopy, 5 <sup>th</sup> ed., McGraw-Hill publishers, 2013	
	5. Peter W. Atkins, Julio de Paula, James Keeler, Physical Chemistry, 11 <sup>th</sup> ed., Oxford publishers, 2018	
		6. K. P. C. Vollhardt, N. E. Schore, Organic Chemistry: Structure and Function 7 <sup>th</sup> ed., Freeman, 2014

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

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

<b>Course Designers</b>					
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)
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CLR-1:	CLR-2:	CLR-3:	CLR-4:	CLR-5:	CLR-6:	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
Application of Matrices in problems of Science and Engineering	Utilize Taylor series, Maxima minima, composite function and Jacobian in solving real-time application problems	Apply the concept of Differential Equations in problems of Science and Engineering	Utilize the concepts of radius of curvature, evolute, envelope in problems of Science and Engineering	Application of Sequences and Series in all problems involving Science and Engineering	Utilize appropriate mathematical techniques for the different solutions required in Science and Engineering applications																		
Course Learning Outcomes (CLO):		At the end of this course, learners will be able to:																					
CLO-1:	Apply Matrices, Eigenvalues and Eigen Vectors Reduce to Quadratics form in Science and Engineering problem solving	2	8	8		H	-	H	-	-	-	-	-	-	H	-	-	H	-	-	-	-	-
CLO-2:	Apply Maxima and Minima, Jacobian, and Taylor series to solve problems in Science and Engineering	2	8	8		H	-	-	H	H	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-3:	Solve the different types of Differential Equations in Science and Engineering applications	2	8	8		-	H	-	-	-	-	-	-	-	H	-	-	H	-	-	-	-	-
CLO-4:	Identify Radius, Centre, envelope and Circle of curvature and apply them in the problem solving	2	9	9		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	9	8		-	H	H	-	-	-	-	-	-	H	-	-	H	-	-	-	-	-
CLO-6:	Identify, Analyze and Apply mathematical techniques to arrive at solutions in Science and Engineering	2	9	9		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 2 <sup>nd</sup> 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	Finding 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 Multiplier method	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 Multiplier method	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

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

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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)
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CLR-1:	Evaluate Double and triple Integral and apply them in problems in Engineering Industries	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2:	Evaluate Surface, Volume Integral and Application of Gauss theorem, Stokes and Green's theorem in Engineering fields																		
CLR-3:	Transform engineering problems into ODE, PDE and Integrals and solve them using Laplace / complex analytic methods																		
CLR-4:	To know the properties of Complex functions and apply them in the all Engineering fields																		
CLR-5:	Evaluate improper integrals involving complex functions using Residue theorem and apply them in Engineering fields																		
CLR-6:	Identify how Engineering problems can be transformed in to simple mathematical constructs and solve the same																		
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	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	950	90	H	-	H	-	-	-	-	-	H	-	-	H	-	-	-
CLO-2:	Apply techniques of vector calculus in problems involving Science and Engineering. Solving Ordinary Differential Equations	3	980	85	H	-	-	H	H	-	-	-	-	-	-	-	-	-	-
CLO-3:	Apply techniques of Laplace Transforms and inverse transform for problems in Science and Engineering	2	850	80	-	H	-	-	-	-	-	-	H	-	-	H	-	-	-
CLO-4:	Apply complex analytic functions and its properties in solving problems	3	880	80	H	H	-	H	-	-	-	-	H	-	-	H	-	-	-
CLO-5:	Evaluate improper integrals using Residue theorem involving problems in Science and Engineering	2	890	90	-	H	H	-	-	-	-	-	H	-	-	H	-	-	-
CLO-6:	Create mathematical constructs for engineering problems and identify solutions to solve them	3	980	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	Irrrotational 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



	<b>SLO-2</b>	Area as a double integral (Cartesian)	Surface integrals	Inverse Laplace transforms using Partial fractions	Conformal mappings: rotation	Singularities
<b>S-6</b>	<b>SLO-1</b>	Area as a double integral (Cartesian)	Surface integrals	Inverse Laplace transforms using second shifting theorem	Conformal mappings: inversion	Types of Poles and Residues
	<b>SLO-2</b>	Area as a double integral (polar)	Volume Integrals	LT using Convolution theorem - problems only	Conformal mappings: inversion	Types of Poles and Residues
<b>S-7</b>	<b>SLO-1</b>	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)-
	<b>SLO-2</b>	Triple integration in Cartesian coordinates	Green's theorem (without proof),	ILT using Convolution theorem - problems only	Conformal mappings: reflection	Contour integration: Unit circle.
<b>S-8</b>	<b>SLO-1</b>	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
	<b>SLO-2</b>	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
<b>S-9</b>	<b>SLO-1</b>	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.
	<b>SLO-2</b>	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
<b>S-10</b>	<b>SLO-1</b>	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.
	<b>SLO-2</b>	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.
<b>S-11</b>	<b>SLO-1</b>	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.
	<b>SLO-2</b>	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.
<b>S-12</b>	<b>SLO-1</b>	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
	<b>SLO-2</b>	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 <b>Contour integration</b> in engineering

<b>Learning Resources</b>	<p>1. B. H. Erwin kreyszig, <i>Advanced Engineering Mathematics</i>, 9th Edition, John Wiley &amp; Sons, 2006.</p> <p>2. B. S. Grewal, <i>Higher Engineering Mathematics</i>, Khanna Publishers, 36th Edition, 2010.</p> <p>3. Veerarajan T., <i>Engineering Mathematics for first year</i>, Tata McGraw-Hill, New Delhi, 2008</p>	<p>4. Ramana B.V., <i>Higher Engineering Mathematics</i>, Tata McGraw Hill New Delhi, 11<sup>th</sup> Reprint, 2010</p> <p>5. G.B. Thomas and R.L. Finney, <i>Calculus and Analytic geometry</i>, 9th Edition, Pearson, Reprint, 2002</p> <p>6. N.P. Bali and Manish Goyal, <i>A text book of Engineering Mathematics</i>, Laxmi Publications, Reprint, 2008</p>
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<b>Learning Assessment</b>											
	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										
	<b>Total</b>	100 %		100 %		100 %		100 %		100 %	

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

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2. Dr. Sricharan Srinivasan, Wipro Technologies, sricharanms@gmail.com	2. Dr. Nanjundan, Bangalore University, nanzundan@gmail.com			2. Dr. Srinivasan, SRMIST

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

Pre-requisite Courses	18MAB102T	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):		The purpose of learning this course is to:	Learning			Program Learning Outcomes (PLO)														
			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	8	8	M	H	L	-	-	-	-	-	M	-	-	H	-	-	-
				5	0															
CLO-2:	Explain the expansion of a discontinuous function as an infinite form of trigonometric sine and cosine series.		2	8	8	M	H	-	M	M	-	-	-	M	L	-	H	-	-	-
				5	0															
CLO-3:	Decide a proper form of solution for the differential equations which are of hyperbolic and parabolic type		2	8	8	M	H	-	-	-	-	-	-	M	-	-	H	-	-	-
				5	0															
CLO-4:	justify the relationship between aperiodic signals and linear combination of exponentials.		2	8	8	M	H	-	M	-	-	-	-	M	L	-	H	-	-	-
				5	0															
CLO-5:	Relate signal analysis with that of z transform		2	8	8	M	H	L	-	-	-	-	-	M	-	-	H	-	-	-
				5	0															
CLO-6:	Relate PDE, Fourier series, Boundary value problems, Fourier and Z transforms		2	8	8	L	L	L	H	H	H	L	H	H	H	-	H	-	-	-
				5	0															

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
	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
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
	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
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
	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
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
	SLO-2				Problem solving using tutorial sheet 13

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	Final 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
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 Type 2: $\sin(ax+by)$ 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, <i>Advanced Engineering Mathematics</i> , 10th Edition, John Wiley & Sons, 2006	4. Ramana B.V., <i>Higher Engineering Mathematics</i> , Tata McGraw Hill New Delhi, 3rd Edition, 2010
	2. B.S. Grewal, <i>Higher Engineering Mathematics</i> , Khanna Publishers, 43rd Edition, 2015	6. N.P. Bali and Manish Goyal, <i>A text book of Engineering Mathematics</i> , for third semester, Laxmi Publications, 3rd Edition, 2014
	3. Veerarajan T., <i>Transforms and Partial Differential Equations</i> , Tata McGraw-Hill, New Delhi, 2012	

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#		Theory	Practice
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice		
Level 1	Remember	40 %	-	30 %	-	30 %	-	30 %	-	30%	-
	Understand										
Level 2	Apply	40 %	-	40 %	-	40 %	-	40 %	-	40%	-
	Analyze										
Level 3	Evaluate	20 %	-	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. 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)														
CLR-1:	Apply and evaluating probability using random variables	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2:	Gain the knowledge and acquire the application of distribution to find the probability using Theoretical distributions	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Modern Tool Usage	Society & Culture	Environment & Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO - 3		
CLR-3:	To Assess the appropriate model and apply and solving 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 Monroviens																		
CLR-6:	Interpret random variables and Queueing 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	8 5	8 0	M	H	L	-	-	-	-	M	-	-	H	-	-	-	
CLO-2:	Identifying Distribution and solving the problems in Discrete and Continuous Distribution	3	8 5	8 0	M	H		M	M	-	-	M	L	-	H	-	-	-	
CLO-3:	Decision Models using sampling techniques in Large and Small samples	3	8 5	8 0	M	H	-	-	-	-	-	M	-	-	H	-	-	-	
CLO-4:	Solving Queueing problems using Kendall's notation	3	8 5	8 0	M	H	-	-	-	-	-	M	L	-	H	-	-	-	
CLO-5:	To Evaluate the probability in uncertain situations using Markov chain rule	3	8 5	8 0	M	H	L	M	-	-	-	M	-	-	H	-	-	-	
CLO-6:	Solving and analyzing the problems in random variables and Queueing theory.	3	8 5	8 0	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
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	4. Trivedi K S, Probability and Statistics with reliability, Queueing and Computer Science Applications, prentice Hall of India, New Delhi, 1984	
	2. S.C. Gupta, V.K.Kapoor, Fundamentals of Mathematical Statistics, 9 <sup>th</sup> ed.,, Sultan Chand & Sons, 1999		5. Allen .A.O. , Probability Statistics and Queueing theory, Academic Press
	3. Gross. D and Harri.C.M. Fundamentals of Queueing theory, John Wiley and Sons, 1985		

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 %	

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Course Designers					
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2. Dr. Srīcharan Srinivasan, Wipro Technologies, srīcharanms@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):		Learning			Program Learning Outcomes (PLO)																	
CLR-1:		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15			
Apply set theory, functions and relations in storage, communication and manipulation of data					1	2	3	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
Apply number theory concepts in computer engineering such as public key crypto system.					M	H	L	M	L						M	L		H				
Apply mathematical reasoning in computer science such as design of computer circuit, verification of programs.					M	H		M	M						M	L		H				
Learning about groups, rings and fields. Solving problems on coding theory.					M	H		M	M						M	L		H				
Using graph models in computer network and shortest path problems Apply graph coloring in problems involving scheduling and assignments.					M	H		M	M						M	L		H				
Apply mathematical reasoning, combinatorial analysis, algebraic structures and graph theory in solving mathematical problems as applied to the respective branches of Engineering.		M	H	L								M	L		H							
Apply mathematical reasoning, combinatorial analysis, algebraic structures and graph theory in solving mathematical problems as applied to the respective branches of Engineering.		M	H									M	L		H							
Course Learning Outcomes (CLO):		Learning			Program Learning Outcomes (PLO)																	
CLO-1:		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15			
Problem solving in sets, relations and functions.					3	85	80	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
Solving problems in basic counting principles, inclusion exclusion and number theory.					M	H	L	M	L						M	L		H				
Solving problems of mathematical logic, inference theory and mathematical induction.					M	H		M	M						M	L		H				
Gaining knowledge in groups, rings and fields. Solving problems in coding theory.					M	H		M	M						M	L		H				
Gaining knowledge in graphs and properties. Learning about trees, minimum spanning trees and graph coloring.					M	H	L								M	L		H				
Learning mathematical reasoning, combinatorial analysis, algebraic structures and graph theory.		M	H									M	L		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	Poset - Graphs of relations Digraphs	Divisibility and prime numbers.	Equivalences – truth table method to prove equivalences.	Rings- definition and examples..Zero divisors.	Eulerian and Hamiltonian graphs.
S-5	SLO-1	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.
	SLO-2					

S-6	SLO-1	Closures of relations- examples	Finding prime factorization of a given number.	Laws of logic and some equivalences.	Fields – definition, examples and properties.	Matrix representation of graphs-adjacent and incidence matrices and examples.
	SLO-2	Transitive closure and warshall's algorithm	Some more problems using fundamental theorem of arithmetic.	Proving equivalences and implications using laws of logic.	Coding Theory – Encoders and decoders- Hamming codes.	Isomorphism using adjacency.
S-7	SLO-1	Functions – definitions, domain and range of a function - examples	Division algorithm- greatest common divisor and properties- problems.	Rules of inference – Rule P, Rule T and Rule CP	Hamming distance. Error detected by an encoding function.	Digraphs – in degree and out degree – Hand shaking theorem.
	SLO-2	Types of functions- one- one and onto- bijection- examples.	Euclid's algorithm for finding GCD(a,b)- examples..	Direct proofs	examples.	Verification of hand shaking theorem in digraphs.
S-8	SLO-1	Problem solving using tutorial sheet 2	Problem solving using tutorial sheet 5	Problem solving using tutorial sheet 8	Problem solving using tutorial sheet 11	Problem solving using tutorial sheet 14
	SLO-2	Composition of functions – examples.	Problems using Euclid's algorithm.	Problems using direct method.	Error correction using matrices.	Graph colouring – chromatic number-examples.
S-9	SLO-1	Associativity 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.
	SLO-2	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.
S-10	SLO-1	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.
	SLO-2	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.
S-11	SLO-1	Checking if a given function is bijection and if so, finding inverse, domain and range- problems.	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. 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., 35 <sup>th</sup> 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%	-
Level 2	Understand	40 %	-	40 %	-	40 %	-	40 %	-	40%	-
	Apply										
Level 3	Analyze	20 %	-	30 %	-	30 %	-	30 %	-	30%	-
	Evaluate										
	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@iit.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

<b>Course Learning Rationale (CLR):</b>	The purpose of learning this course is to:			<b>Learning</b>			<b>Program Learning Outcomes (PLO)</b>														
<b>CLR-1:</b>	Recall the cell structure and function from its organization			1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<b>CLR-2:</b>	Discuss molecular and biochemical basis of an organism			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
<b>CLR-3:</b>	Compare enzyme reaction and photosynthesis						L	H	H	H	-	M	L	H	H	H	-	H	L	H	H
<b>CLR-4:</b>	Explain different types of biosensors						M	H	H	M	-	-	M	H	L	H	-	H	L	H	H
<b>CLR-5:</b>	Analyze the different types of bioremediation						M	H	M	H	M	-	M	H	H	H	-	H	L	H	H
<b>CLR-6:</b>	Relate the concept of nervous and immune system pertaining to diseases						L	H	H	H	-	-	H	L	L	H	-	H	M	H	H
<b>CLR-6:</b>	Relate the concept of nervous and immune system pertaining to diseases						L	H	H	M	-	M	H	H	H	L	-	H	H	H	H
<b>Course Learning Outcomes (CLO):</b>	At the end of this course, learners will be able to:			2	80	80	M	H	H	H	L	H	M	M	H	H	-	H	H	H	H
<b>CLO-1:</b>	Describe the cell growth, metabolism and reproduction.			1	80	80	L	H	H	H	-	M	L	H	H	H	-	H	L	H	H
<b>CLO-2:</b>	Explain the concepts and experiments in biochemistry			2	85	75	M	H	H	M	-	-	M	H	L	H	-	H	L	H	H
<b>CLO-3:</b>	Recognize the significance of photosynthesis			2	75	80	M	H	M	H	M	-	M	H	H	-	H	L	H	H	H
<b>CLO-4:</b>	Discuss the different methods in enzyme catalytic functions			2	85	80	L	H	H	H	-	-	H	L	L	H	-	H	M	H	H
<b>CLO-5:</b>	Analyze the role of biosensors and its applications			3	85	75	L	H	H	M	-	M	H	H	H	L	-	H	H	H	H
<b>CLO-6:</b>	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	<b>SLO-1</b>	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
	<b>SLO-2</b>	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	<b>SLO-1</b>	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
	<b>SLO-2</b>	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	<b>SLO-1</b>	Cell metabolism	Eukaryotic and prokaryotic protein synthesis difference	Mechanism of enzyme action	Microtubules	Diseases of nervous system
	<b>SLO-2</b>	Carbohydrate metabolism, Fatty acid metabolism	Concept of genetic code, Stem cells	Enzyme strategies, Restriction enzymes	Microfilaments, Intermediate filaments	Computer- based neural networks
S-4	<b>SLO-1</b>	Homeostasis	Source of stem cells, Classification of stem cells	NMP kinases, Photosynthesis	Kinesin linear motor, Dynein motor	Immune system
	<b>SLO-2</b>	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	<b>SLO-1</b>	Reproduction	Therapeutic cloning	ATP synthesis in chloroplasts	Resonant biosensors, Glucose biosensors	Cells of innate immune system, Adaptive immunity
	<b>SLO-2</b>	Eukaryotic cell division, Mitosis	Regenerative medicine	Calvin cycle	Bio detectors, Biosensor detection in pollutants	Diseases of immune system, Immune engineering
S-6	<b>SLO-1</b>	Meiosis, Cell differentiation	Bone tissue engineering	Significance of photosynthesis	Bioremediation	Cell signaling
	<b>SLO-2</b>	Neural crest	Gene therapy	Metabolism, Glycolysis	Bioventing and bio augmentation	Cell- surface receptors

<b>Learning Resources</b>	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
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<b>Learning Assessment</b>											
	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.,

<b>Course Designers</b>		
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, <a href="mailto:karthikmpk@gmail.com">karthikmpk@gmail.com</a>	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)
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CLR-1:	Utilize engineering graphic fundamentals. apply the same to draw/evaluate engineering curves and projection of objects	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2:	Draw projection of solid objects like prisms, cylinders, pyramids and cones used in various engineering objects	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 - I	PSO - II	PSO - III
CLR-3:	Draw the projection of combination of solids, and section of solids. Create building plans for construction																		
CLR-4:	Create 3D part models. Develop its surfaces using solid-modeling software for effectiveness, clarity, accuracy, portability																		
CLR-5:	Evaluate the assembly of engineering component parts. Create 2D drawings for assembly of engineering components																		
CLR-6:	Draw, Create, Evaluate, Interpret engineering 2D and 3D surfaces of engineering components using modeling software																		

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	3	90	85	H	H	L	L	L	H	L	H	L	H	L	L	L	L	L
CLO-1:	Identify engineering graphics. Draw objects like points, lines, planes, and solids in perspective & orthographic projections	2	95	90	M	M	L	L	M	H	H	L	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	3	90	85	H	H	M	M	H	H	H	H	M	H	L	H	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	H	H	H	H	H	H	H	H	L	H	M	L	M
CLO-4:	Create 3D part models. Develop its surfaces with solid modeling software for effectiveness, clarity, accuracy, portability	3	85	80	H	H	M	H	H	H	H	L	H	L	H	L	M	L	L
CLO-5:	Evaluate the assembly of parts including interference of parts. Create 2D drawings of assembly of parts	2	90	85	M	M	L	M	L	L	L	H	L	L	L	L	L	L	L
CLO-6:	Draw graphics of engineering pans with point, line, plane, solids, in perspective and orthographic projections																		

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

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

<b>Learning Resources</b>	1. Bhatt, N.D., Engineering Drawing (First Angle Projection), 53 <sup>rd</sup> ed., Charotar Publishing House, 2017	7. Narayanan, K. L., Kannaiah, V., Engineering Graphics, Scitech Publications, 2010
	2. Bethunc, J., Engineering Graphics with AutoCAD 2017, Pearson Education, 2016	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.
	3. Khristorof Artemyevich Arustamov, Problems in projective geometry, MIR Publishers, Moscow, 1972	9. Mohammad Dashtbaz, Chris Gorse, Alice Moncaster (eds.), Building Information Modelling, Building Performance, Design and Smart Construction, Springer 2017
	4. Natarajan, K.V., A Text Book of Engineering Graphics, 21st Edition, Dhanalakshmi Pub., 2012	10. User Manual of Respective CAD Softwares
	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	

<b>Learning Assessment</b>											
	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.,

<b>Course Designers</b>		
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)
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CLR-1:	Analyze given electric circuits consisting of active and passive components	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15			
CLR-2:	Identify the parts, functions and working of motors, generators and transformers that function in AC and DC	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-3:	Utilize the basic electronic devices and circuits				H	M	L	L	M	-	M	M	M	M	M	M	-	M	-	-	-	-
CLR-4:	Utilize transducers for measuring displacement, pressure, flow, sound, light, temperature, chemical changes etc.,				H	M	L	L	M	-	M	M	M	M	M	M	-	M	-	-	-	-
CLR-5:	Build simple logical circuits using Boolean expressions. Identify elements in a communication system				H	-	L	L	M	-	M	M	M	M	M	M	-	M	-	-	-	-
CLR-6:	Utilize the basic electrical circuits, machines, electronic devices, transducers and digital system principles and operations				H	M	M	M	M	-	M	M	M	M	M	M	-	M	-	-	-	-
					-	-	L	M	M	-	M	M	M	M	M	M	-	M	-	-	-	-

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	3	75	70
CLO-1:	Analyze basic theory utilized in electrical circuits and its circuits	3	75	70
CLO-2:	Identify working principle of direct current and alternative current machines such as transformers, motors and generators	2	75	70
CLO-3:	Operate the basic electronic devices. Identify their uses and construction features	3	75	70
CLO-4:	Identify the different types of transducers used in measurement of various physical parameters	3	75	70
CLO-5:	Apply binary logic and Boolean expressions for digital circuit design, Identify elements in a communication Systems	3	75	70
CLO-6:	Identify the basic electrical circuits, machines, electronic devices, transducers and digital system principles and operations	3	75	70

Duration (hour)	Electrical Circuits	D.C Machines& A.C Machines	Electronic Devices	Transducers	Digital Systems	
	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 and Passive 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	Mesh Current Analysis	Construction, working of DC Generators	Overview of Semiconductors	Chemical: pH probes, Electro galvanic Sensor etc.,	SOP and POS Expressions
S-7	SLO-1	Nodal Voltage Analysis	Types of DC generators	PN junction diode	Electroacoustic: Mic, Speaker, Piezoelectric, Sonar, Ultrasonic	Standard forms of Boolean expression
	SLO-2	Thevenin's Theorem	Characteristics of Generators	Zener diode	Tactile, Geophones, Hydrophone	Simplify using Boolean Expressions
S-8	SLO-1	Norton's Theorem	Armature reaction, Losses	Diode circuits: rectifiers, half and full wave	Electrooptical: LED, Laser, Photodiode, Photoresistor, Phototransistor	Minterm and Maxterm
	SLO-2	Maximum Power Transfer Theorem	Power stages of DC generators	Bridge type rectifier, filter circuit	Photoconductive cell, photovoltaic cell, solar cell	K-Map Simple Reduction Technique
S-9	SLO-1	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
	SLO-2	Problem Solving Session	Problem Solving Session	Problem Solving Session	Problem Solving Session	Problem Solving Session
S-10	SLO-1	Problem Solving Session	Problem Solving Session	Problem Solving Session	Problem Solving Session	Problem Solving Session

S 11-12	SLO-2					
	SLO-1 SLO-2	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
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 SLO-2	Problem Solving Session	Problem Solving Session	Problem Solving Session	Problem Solving Session	Problem Solving Session
S 17-18	SLO-1 SLO-2	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

Learning Resources	1. Dash.S.S, Subramani.C, Vijayakumar.K, Basic Electrical Engineering, 1st ed., Vijay Nicole, 2013	4. R. Muthusubramanian, S. Sallivahanan, "Basic Electrical and Electronics Engineering, Tata McGraw-Hill, 2012
	2. Jegatheesan.R, Analysis of Electric Circuits, Tata McGraw-Hill, 2014	
	3. P. S. Bimbhra, Electrical Machinery, 7 <sup>th</sup> ed., Khanna Publishers, 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., paramathya@yahoo.com	1. Dr. K. S. Swarup, IIT Madras, ksswarup@itm.ac.in	1. Dr. K. Vijayakumar, SRMIST
2. Dr. Sricharan Srinivasan, Wipro Technologies, sricharanms@gmail.com	2. Dr. Rajeev Sukumaran, IIT Madras, rajeev@wmail.itm.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)
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CLR-1:	Practice machining and glass cutting shop floor trade	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
CLR-2:	Practice arc & gas welding, and fitting and make new assemblies according to various dimensions and tolerances	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-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:	1	90	85	H	L	H	L	M	H	H	L	M	L	L	H	L	L	L
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	M	M	M
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	M	M	H	L	M	L	L	M	L	L	L
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	M	L	M	H	H	L	L	L	L	M	L	L	L
CLO-4:	Practice casting, moulding, & smithy trades	2	90	85	H	L	H	L	M	H	M	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

Duration (hour)	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)
15	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	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
2-5	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 tapping processes, 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	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
7-10	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	SLO-1: Make glass panels for boxes	Step fitting of two metal plates using fitting tools	To make geometrical shape like frustum, Cone and Prism using G.I sheet	To forge chisel from MS rod using black smithy	Plumbing of pipe lines and fitting for Pumps using G.I fittings
12-15	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., Nirjar Roy S.K., Elements of Workshop Technology, Vol.I & Vol.II 2010, Media promoters and publishers private limited, Mumbai. 7. Rao P.N., Manufacturing Technology, Vol. I & Vol. II, Tata McGrawHill, 2017.
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3. Bawa H.S., <i>Workshop Practice</i> , Tata McGraw, 2007.	8. Gopal T.V, Kumar. T, Murali. G, <i>A first course on workshop practice – Theory, Practice and Work Book</i> , Suma Publications, Chennai, 2005.
4. Rajendra Prasad A. & Sarma P.M.M.S., <i>Workshop Practice</i> , 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	-	40%	-	30%	-	30%	-	30%	-	30%
Level 2	Apply	-	40%	-	40%	-	40%	-	40%	-	40%
	Analyze	-	40%	-	40%	-	40%	-	40%	-	40%
Level 3	Evaluate	-	20%	-	30%	-	30%	-	30%	-	30%
	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@itm.ac.in	1. Mr.A.Thirugnanam, SRMIST
2.Dr. A. Velayutham, DRDO,	2. Dr. Sourav Rakshit, IIT Madras, srakshit@itm.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)														
CLR-1:	Think and evolve a logically to construct an algorithm into a flowchart and a pseudocode that can be programmed	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2:	Utilize the logical operators and expressions to solve problems in engineering and real-time	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-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 Lab 1: Algorithm, Flow Chart, Pseudocode	Lab 4: Operators and Expressions	Lab 7: Arrays - Multidimensional	Lab 10: Functions	Lab 13: Structures & Unions
	SLO-2				
S-8	SLO-1 Input and output functions: Printf and scanf	Control Statements – if and else	String Basics	Pointers and address operator	Bit Manipulation to structure and Pointer to structure
	SLO-2 Variables and identifiers	else if and nested if, switch case	String Declaration and Initialization	Size of Pointer Variable and Pointer Operator	Union Basic and declaration
S-9	SLO-1 Expressions	Iterations, Conditional and Unconditional branching	String Functions: gets(), puts(), getchar(), putchar(), printf()	Pointer Declaration and dereferencing pointers	Accessing Union Members Pointers to Union
	SLO-2 Single line and multiline comments	For loop	String Functions: atoi, strlen, strcat, strcmp	Void Pointers and size of Void Pointers	Dynamic memory allocation, malloc, realloc, free
S-10	SLO-1 Constants, Keywords	While loop	String Functions: sprintf, sscanf, strcmp, strcpy, strstr, strtok	Arithmetic Operations	Allocating Dynamic Array
	SLO-2 Values, Names, Scope, Binding, Storage Classes	do while, goto, break, continue	Arithmetic Characters on Strings	Incrementing Pointers	Multidimensional array using dynamic memory allocation.
S 11-14	SLO-1 Lab 2: Input and Output Statements	Lab 5: Control Statements	Lab 8: Strings	Lab 11: Pointers	Lab 14: Structures & Unions
	SLO-2				

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

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

#### 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. Sainarayanan Gopalakrishnan, HCL Technologies, <a href="mailto:saijgk@gmail.com">saijgk@gmail.com</a>	1. Prof. Janakiram D, IIT Madras, <a href="mailto:djram@iitm.ac.in">djram@iitm.ac.in</a>	1. Dr. Christhu Raj M R, SRMIST
2. Dr. Sricharan Srinivasan, Wipro Technologies, <a href="mailto:sricharanms@gmail.com">sricharanms@gmail.com</a>	2. Dr. Rajeev Sukumaran, IIT Madras, <a href="mailto:rajeev@wmail.iitm.ac.in">rajeev@wmail.iitm.ac.in</a>	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)																	
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15			
CLR-1:	Identify the applications of analog electronics	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life-Long Learning	PSO - 1	PSO - 2	PSO - 3			
CLR-2:	Identify the applications of digital logic families				H	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLR-3:	Design the combinational and sequential logic circuits				H	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLR-4:	Implement the combinational and sequential logic circuits				H	H	-	H	H	-	-	-	-	-	-	-	-	-	H	-	-	-
CLR-5:	Analyze the design of counters and registers				H	-	H	H	H	-	-	-	-	-	-	-	-	-	-	-	-	-
CLR-6:	Utilize the concepts in real time scenarios				3	80	70	-	-	H	H	-	H	-	-	H	-	H	-	-	-	-
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																					
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	-	-	-			
CLO-5:	Apply HDL code and synthesize	2	85	75	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	III	Encoder	Edge-triggered T FLIP-FLOPs	Asynchronous Counters
S 4-5	SLO-1 Lab 1: Design and Implement Half and Full Wave Rectifiers using simulation	Lab 4: Design and implement transistor as a switch	Lab 7: Design and implement code converters using logic gates simulation	Lab 10: HDL implementation of Flip-Flop	Lab 13: Implement SISO, SIPO, PISO and PIPO shift registers using Flip-flops
	SLO-2 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
S-6	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 Synchronous Sequential Circuit, State Equation, State table	Presetable counters
	SLO-2 Performance Parameters	CMOS Logic	Decimal adder	State Diagram	Counter Design as a Synthesis problem
S-8	SLO-1 Applications: Peak detector, Comparator, Inverting, Non-Inverting Amplifiers	Propagation delay	Magnitude Comparator	Synthesis of sequential circuit using Flip-Flops	Seven segment Display and A Digital Clock.
	SLO-2 Problem solving session	Problem solving session	Problem solving session	Problem solving session	Problem solving session
S 9-10	SLO-1 Lab 2: Design and implement Schmitt trigger using Op-Amp (Simulation)	Lab 5: Design CMOS Inverter, measure propagation delay for rising & falling edge	Lab 8: Design and implement using simulation the combinational circuits	Lab 11: Design and implement using simulation; Synchronous sequential circuits	Lab 14: HDL for Registers and Counters
	SLO-2				

S-11	SLO-1	Effect of positive and Negative Feedback Amplifiers,	Tristate Logic	Read Only Memory	Asynchronous sequential circuit	D/A Conversion
	SLO-2	Analysis of Practical Feedback Amplifiers	Tristate Logic Applications	Arithmetic Logic Unit	Transition Table	Types of D/A Converters
S-12	SLO-1	Oscillator Operation	FPGA Basics	Programmable Logic Arrays	State table	Problem
	SLO-2	Crystal Oscillator	Introduction to HDL and logic simulation	HDL Gate and Data Flow modeling	Flow table	A/D Conversion
S-13	SLO-1	Overview of UJT, Relaxation Oscillator,555 Timer	HDL System primitives, user defined primitives, Stimulus to the design	HDL Behavioral modeling	Analysis of asynchronous sequential circuits	Types of A/D conversion
	SLO-2	Problem solving session	Problem solving session	Problem solving session	Problem solving session	Problem solving session
S 14-15	SLO-1	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.
	SLO-2					

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

#### Learning Assessment

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

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

#### Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr.Devi Jayaraman , Virtusa, devij@virtusa.com	1.Dr. J. Dhalla 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):		Learning			Program Learning Outcomes (PLO)															
CLR-1:		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
The purpose of learning this course is to:																				
Understand the basic services and concepts related to Internetwork																				
Understand the layered network architecture																				
Acquire knowledge in IP addressing																				
Exploring the services and techniques in physical layer																				
Understand the functions of Data Link layer																				
Implement and analyze the different Routing Protocols																				
Course Learning Outcomes (CLO):		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	
Apply the knowledge of communication		2	80	70	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Identify and design the network topologies		3	85	75	H	-	H	-	-	-	-	-	-	-	-	-	M	-	-	
Design the network using addressing schemes		3	75	70	H	H	-	-	-	-	-	-	-	-	-	-	M	-	M	
Identify and correct the errors in transmission		1	85	80	H	H	-	-	-	-	-	-	-	-	-	-	-	-	-	
Identify the guided and unguided transmission media		1	85	75	H	-	-	H	-	-	-	-	-	-	-	-	-	-	-	
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	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)
	SLO-2	Layers in the OSI model, Functions of Physical layer, data link layer	Special Addresses	Multiplexing: FDM	Types of Errors	Distance Vector Routing, Problem Solving
S-5	SLO-1	Functions of Network layer, Transport layer	Special Addresses	Multiplexing: FDM	Types of Errors	Link state Routing
	SLO-2	Functions of Session, Presentation layer and Application layer	Classless Addressing	TDM	Forward Error correction	Problem solving
S-6	SLO-1	TCP/IP protocol suite, Link layer protocols	Problem Solving	WDM	CSMA, CSMA/CD	Path vector Routing
	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-7-8	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-9	SLO-1	Serial and Parallel Transmissions	Bridge	Microwaves	HDLC	EIGRP
	SLO-2	Addressing	Structure of Router	Infrared	PPP	BGP
S-10	SLO-1	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
	SLO-2					

<b>Learning Resources</b>	1. Behrouz A. Forouzan, "Data Communications and Networking" 5th ed., 2010	3. William Stallings, Data and Computer Communications, 9th ed., 2010
	2. Bhushan Trivedi, "Data Communication and Networks" 2016	4. Todd Lammle, CCNA Study Guide, 7th ed. 2011

<b>Learning Assessment</b>											
	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.,

<b>Course Designers</b>		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. Viswanadhan, Teken BIM Technologies, viswanathan_alladi@yahoo.com	1. Dr. J. Dhaliya 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



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 using Pointers	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, 2 <sup>nd</sup> 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, 2 <sup>nd</sup> ed., Pearson Education, 2015	5. Reema Thareja, Data Structures Using C, 1 <sup>st</sup> ed., Oxford Higher Education, 2011 6. Thomas H Cormen, Charles E Leiserson, Ronald L Revest, Clifford Stein, Introduction to Algorithms 3 <sup>rd</sup> 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%
Level 2	Understand	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Level 3	Apply	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	Analyze										
	Evaluate										
	Create										
	Total	100 %		100 %		100 %		100 %		-	

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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





	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, <i>Object-Oriented Analysis and Design with Applications</i> , 3 <sup>rd</sup> ed., Addison-Wesley, May 2007	4. Robert Lafore, <i>Object-Oriented Programming in C++</i> , 4 <sup>th</sup> ed., SAMS Publishing, 2008 5. Ali Bahrami, <i>Object Oriented Systems Development</i> , McGraw Hill, 2004 6. Craig Larmen, <i>Applying UML and Patterns</i> , 3 <sup>rd</sup> ed., Prentice Hall, 2004
	2. Reema Thareja, <i>Object Oriented Programming with C++</i> , 1 <sup>st</sup> ed., Oxford University Press, 2015	
	3. Sourav Sahay, <i>Object Oriented Programming with C++</i> , 2 <sup>nd</sup> ed., Oxford University Press, 2017	

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember 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 %		-	

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# 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. Thamichelvi, 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:			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 functional units of a computer				Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge																		
CLR-2:	Analyze the functions of arithmetic Units like adders, multipliers etc.							Problem Analysis																		
CLR-3:	Understand the concepts of Pipelining and basic processing units							Design & Development																		
CLR-4:	Study about parallel processing and performance considerations.							Analysis, Design, Research																		
CLR-5:	Have a detailed study on Input-Output organization and Memory Systems.							Modern Tool Usage																		
CLR-6:	Simulate simple fundamental units like half adder, full adder etc							Society & Culture																		
Course Learning Outcomes (CLO):		At the end of this course, learners will be able to:			Environment & Sustainability																					
CLO-1:	Identify the computer hardware and how software interacts with computer hardware				Ethics																					
CLO-2:	Apply Boolean algebra as related to designing computer logic, through simple combinational and sequential logic circuits				Individual & Team Work																					
CLO-3:	Analyze the detailed operation of Basic Processing units and the performance of Pipelining				Communication																					
CLO-4:	Analyze concepts of parallelism and multi-core processors.				Project Mgt. & Finance																					
CLO-5:	Identify the memory technologies, input-output systems and evaluate the performance of memory system				Life Long Learning																					
CLO-6:	Identify the computer hardware, software and its interactions				PSO - 1																					
					PSO - 2																					
					PSO - 3																					

Duration (hour)	15	15	15	15	15	
S-1	SLO-1	Functional Units of a computer	Addition and subtraction of Signed numbers	Fundamental concepts of basic processing unit	Parallelism	Memory systems -Basic Concepts
	SLO-2	Operational concepts	Problem solving	Performing ALU operation	Need, types of Parallelism	Memory hierarchy
S-2	SLO-1	Bus structures	Design of fast adders	Execution of complete instruction, Branch instruction	applications of Parallelism	Memory technologies
	SLO-2	Memory locations and addresses	Ripple carry adder and Carry look ahead adder	Multiple bus organization	Parallelism in Software	RAM, Semiconductor RAM
S-3	SLO-1	Memory operations	Multiplication of positive numbers	Hardwired control	Instruction level parallelism	ROM,Types
	SLO-2	Memory operations	Problem Solving	Generation of control signals	Data level parallelism	Speed,size cost
S-4-5	SLO-1	Lab 1: To recognize various components of PC-Input Output systems	Lab4:Study of TASM	Lab-7: Design of Half Adder	Lab-10: Study of Array Multiplier	Lab-13: Study of Carry Save Multiplication Program to carry out Carry Save Multiplication
	SLO-2	Processing and Memory units	Addition and Subtraction of 8-bit number	Design of Full Adder	Design of Array Multiplier	
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	<b>SLO-1</b>	Lab-2: To understand how different components of PC are connected to work properly	Lab 5: Addition of 16-bit number Subtraction of 16-bit number	Lab-8: Study of Ripple Carry Adder Design of Ripple Carry Adder	Lab-11: Study of Booth Algorithm	Lab-14: Understanding Processing unit Design of primitive processing unit
	<b>SLO-2</b>	Assembling of System Components				
S-11	<b>SLO-1</b>	ARM Processor: The thumb instruction set	Integer division – Restoring Division	Pipeline Hazards-Data hazards	Uni-processor and Multiprocessors	Input Output Organization
	<b>SLO-2</b>	Processor and CPU cores	Solving Problems	Methods to overcome Data hazards	Multi-core processors	Need for Input output devices
S-12	<b>SLO-1</b>	Instruction Encoding format	Non Restoring Division	Instruction Hazards	Multi-core processors	Memory mapped IO
	<b>SLO-2</b>	Memory load and Store instruction in ARM	Solving Problems	Hazards on conditional and Unconditional Branching	Memory in Multiprocessor Systems	Program controlled IO
S-13	<b>SLO-1</b>	Basics of IO operations.	Floating point numbers and operations	Control hazards	Cache Coherency in Multiprocessor Systems	Interrupts-Hardware, Enabling and Disabling Interrupts
	<b>SLO-2</b>	Basics of IO operations.	Solving Problems	Influence of hazards on instruction sets	MESI protocol for Multiprocessor Systems	Handling multiple Devices
S 14-15	<b>SLO-1</b>	Lab -3 To understand how different components of PC are connected to work properly	Lab-6: Multiplication of 8-bit number Factorial of a given number	Lab-9: Study of Carry Look-ahead Adder Design of Carry Look-ahead Adder	Lab-12: Program to carry out Booth Algorithm	Lab-15: Understanding Pipeline concepts Design of basic pipeline.
	<b>SLO-2</b>	Disassembling of System Components				

<b>Learning Resources</b>	1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Computer Organization, 5 <sup>th</sup> ed., McGraw-Hill, 2015	5. William Stallings, Computer Organization and Architecture – Designing for Performance, 10 <sup>th</sup> ed., Pearson Education, 2015
	2. Kai Hwang, Faye A. Briggs, Computer Architecture and Parallel Processing, 3 <sup>rd</sup> ed., McGraw Hill, 2016	
	3. Ghosh T. K., Computer Organization and Architecture, 3 <sup>rd</sup> ed., Tata McGraw-Hill, 2011	6. David A. Patterson and John L. Hennessy Computer Organization and Design - A Hardware software interface, 5 <sup>th</sup> ed., Morgan Kaufmann, 2014
	4. P. Hayes, Computer Architecture and Organization, 3 <sup>rd</sup> ed., 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 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 %			-

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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. Shanthy, ANNA University Chennai, a.p.shanthy@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):		Learning			Program Learning Outcomes (PLO)														
CLR-1:		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
The purpose of learning this course is to:		Level of Thinking (Bloom)			Engineering Knowledge														
Design efficient algorithms in solving complex real time problems		Expected Proficiency (%)			Problem Analysis														
Analyze various algorithm design techniques to solve real time problems in polynomial time		Expected Attainment (%)			Design & Development														
Utilize various approaches to solve greedy and dynamic algorithms					Analysis, Design, Research														
Utilize back tracking and branch and bound paradigms to solve exponential time problems					Modern Tool Usage														
Analyze the need of approximation and randomization algorithms, utilize the importance Non polynomial algorithms					Society & Culture														
Construct algorithms that are efficient in space and time complexities					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:	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
	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
S-2	SLO-1	Correctness of algorithm	Binary Search	Huffman coding using greedy approach	Sum of subsets using backtracking
	SLO-2	Time complexity analysis	Complexity of binary search	Comparison of brute force and Huffman method of encoding	Complexity calculation of sum of subsets
S-3	SLO-1	Insertion sort-Line count, Operation count	Merge sort	Knapsack problem using greedy approach	Graph introduction
	SLO-2	Algorithm Design paradigms	Time complexity analysis	Complexity derivation of knapsack using greedy	Hamiltonian circuit - backtracking
S-4-5	SLO-1	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
	SLO-2				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
	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
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
	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
S-8	SLO-1	Mathematical analysis	Largest sub-array sum	0/1 knapsack problem	Travelling salesman problem using branch and bound example
	SLO-2	Induction, Recurrence relations	Time complexity analysis of Largest sub-array sum	Complexity calculation of knapsack problem	Time complexity calculation with an example
S-9-10	SLO-1	Lab 2: Bubble Sort	Lab 5: Strassen Matrix multiplication	Lab 8: Various tree traversals, Kruksall's MST	Lab 11: Travelling salesman problem
	SLO-2				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, 3 <sup>rd</sup> ed., The MIT Press Cambridge, 2014	3. Ellis Horowitz, Sartaj Sahni, Sanguthevar, Rajesekaran, Fundamentals of Computer Algorithms, Galgotia Publication, 2010
	2. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2 <sup>nd</sup> ed., Pearson Education, 2006	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 %		-	

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Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. G. Venkateswaran, Wipro Technologies, gvenki@pilani.bits-pilani.ac.in	1. Mitesh Khapra, IITM Chennai, miteshk@cse.iitm.ac.in	1. Mr.K.Senthil Kumar, SRMIST
2. Dr.Sainarayanan Gopalakrishnan, HCL Technologies, sai.jgk@gmail.com	2. V. Masilamani, IIITDM, masila@iiitdm.ac.in	2. Dr.A.Razia Sulthana, SRMIST
		3. Mr. V. Sivakumar, SRMIST
		4. Ms. R. Vidhya, SRMIST

Course Code	18CSC205J	Course Name	OPERATING SYSTEMS	Course Category	C	Professional Core			
						L	T	P	C
						3	0	2	4

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

<b>Course Learning Rationale (CLR):</b>	The purpose of learning this course is to:						<b>Learning</b>			<b>Program Learning Outcomes (PLO)</b>																														
CLR-1:	Introduce the key role of an Operating system						1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15																
CLR-2:	Insist the Process Management functions of an Operating 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-3:	Emphasize the importance of Memory Management concepts of an Operating system																								H	H	H	H	H	M	L	M	H	M	M	H	H	H	H	M
CLR-4:	Realize the significance of Device Management part of an Operating system																								H	H	H	H	H	M	L	M	H	M	M	H	H	H	H	M
CLR-5:	Comprehend the need of File Management functions of an Operating system																								H	H	H	H	H	M	L	M	H	M	M	H	H	H	H	M
CLR-6:	Explore the services offered by the Operating system practically																								H	H	H	H	H	M	L	M	H	M	M	H	H	H	H	M
CLR-6:	Explore the services offered by the Operating system practically																								3	80	70	H	H	H	H	H	M	L	M	H	M	M	H	H
<b>Course Learning Outcomes (CLO):</b>	At the end of this course, learners will be able to:																																							
CLO-1:	Identify the need of an Operating system						1	80	70																															
CLO-2:	Know the Process management functions of an Operating system						1	85	75																															
CLO-3:	Understand the need of Memory Management functions of an Operating system						1	75	70																															
CLO-4:	Find the significance of Device management role of an Operating system						2	85	80																															
CLO-5:	Recognize the essentials of File Management part of an Operating system						2	85	75																															
CLO-6:	Gain an insight of Importance of an Operating system through practical						3	80	70																															

Duration (hour)	15	15	15	15	15	
S-1	SLO-1	Operating System Objectives and functions	PROCESS SYNCHRONIZATION : Peterson's solution, Synchronization Hardware	MEMORY MANAGEMENT: Memory Management: Logical Vs Physical address space, Swapping	VIRTUAL MEMORY- Background	STORAGE MANAGEMENT : Mass storage structure – Overview of Mass storage structure – Magnetic Disks
	SLO-2	Gaining the role of Operating systems	Understanding the two-process solution and the benefits of the synchronization hardware	Understanding the basics of Memory management	Understanding the need of demand paging	Understanding the Basics in storage management
S-2	SLO-1	The evolution of operating system, Major achievements	Process synchronization: Semaphores, usage, implementation	Contiguous Memory allocation – Fixed and Dynamic partition	VIRTUAL MEMORY – Basic concepts – page fault handling	Disk Scheduling
	SLO-2	Understanding the evolution of Operating systems from early batch processing systems to modern complex systems	Gaining the knowledge of the usage of the semaphores for the Mutual exclusion mechanisms	Getting to know about Partition memory management and issues: Internal fragmentation and external fragmentation problems	Understanding , how an OS handles the page faults	Understanding the various scheduling with respect to the disk
S-3	SLO-1	OS Design considerations for Multiprocessor and Multicore	Classical Problems of synchronization – Readers writers problem, Bounded Buffer problem	Strategies for selecting free holes in Dynamic partition	Performance of Demand paging	FILE SYSTEM INTERFACE: File concept, File access methods
	SLO-2	Understanding the key design issues of Multiprocessor Operating systems and Multicore Operating systems	Good understanding of synchronization mechanisms	Understanding the allocation strategies with examples	Understanding the relationship of effective access time and the page fault rate	Understanding the file basics
S 4-5	SLO-1	LAB 1 : Understanding the booting process of Linux	LAB4 : System admin commands – Basics	LAB7: Shell Programs – Basic level	LAB10 : Overlay concept	LAB13:Process synchronization
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 Maintenance 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	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

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	page replacement techniques Counting based page replacement and Page Buffering Algorithms	Directory Implementation
	SLO-2	Understanding basics of Process scheduling	Understanding the scheduling techniques	Understanding the Paging in the Intel architectures	To know on additional Techniques available for page replacement strategies	Understanding the various levels of directory structure
S 9-10	SLO-1	LAB2 : Understanding the Linux file system	LAB5: System admin commands – Simple task automations	LAB 8:Process Creation	LAB11: IPC using Pipes	LAB14 : Study of OS161
	SLO-2	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
S-11	SLO-1	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
	SLO-2	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
S-12	SLO-1	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
	SLO-2	PROCESS SYNCHRONIZATION: Background, Critical section Problem	Deadlocks :Deadlock Avoidance, Detection and Recovery	Paged segmentation Technique	Working set Model	Swap space Management
S-13	SLO-1	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
	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

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

Learning Assessment		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		
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	
1.Mr. Balamurugan, Infosys, balams@gmail.com		1. Dr.Latha Parthiban, Pondicherry University, lathaparthiban@yahoo.com	
		Internal Experts	
		1. Dr.G.Maragatham, SRMIST	
		2. Mr. Eliazer M, SRMIST	
		3. Ms. Aruna S, 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	

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

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
H	H	L	-	-	-	L	-	H	H	M	M	-	-	-
H	H	H	H	H	-	M	-	H	H	H	M	-	-	-
H	H	M	H	H	M	M	L	H	H	M	-	-	-	-
H	H	H	-	H	-	-	M	H	M	H	-	-	-	-
H	M	M	M	M	M	M	M	-	H	H	-	M	-	-

<b>Course Learning Outcomes (CLO):</b>	At the end of this course, learners will be able to:			
<b>CLO-1:</b>	Identify the process of project life cycle model and process	1	85	80
<b>CLO-2:</b>	Analyze and specify software requirements through a productive working Relationship with project stakeholders	2	80	75
<b>CLO-3:</b>	Design the system based on Functional Oriented and Object Oriented Approach for Software Design.	3	85	85
<b>CLO-4:</b>	Develop the correct and robust code for the software products	3	85	85
<b>CLO-5:</b>	Perform by applying the test plan and various testing techniques	2	85	75

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	Introduction to Requirement Engineering	Module Coupling	Coding Methods	Test Project Monitoring and Control	User Training				
S-6	SLO-1	Requirements Elicitation	Component level design	Structured Programming	Test Project Monitoring and Control	Maintenance Introduction				
	SLO-2	Software Project Effort and cost estimation	User Interface Design	Object-Oriented Programming	Test Project Monitoring and Control	Maintenance Types - Corrective				
S-7	SLO-1	Cost estimation	Pattern oriented design	Automatic Code Generation	Test Project Monitoring and Control	Adaptive				
	SLO-2	Cocomo 1 and 2	Web application design	Automatic Code Generation	Test Project Monitoring and Control	Perfective				
S-8	SLO-1	Cocomo 1 and 2	Web application design	Automatic Code Generation	Test Project Monitoring and Control	Preventive				
	SLO-2	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				
S 9-10	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-11	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					

<b>Learning Resources</b>	1. Roger S. Pressman, <i>Software Engineering – A Practitioner Approach</i> , 6 <sup>th</sup> ed., McGraw Hill, 2005	5. Ashfaque Ahmed, <i>Software Project Management: a process-driven approach</i> , Boca Raton, Fla: CRC Press, 2012
	2. Ian Sommerville, <i>Software Engineering</i> , 8 <sup>th</sup> ed., Pearson Education, 2010	6. Walker Royce, <i>Software Project Management</i> , Pearson Education, 1999
	3. Rajib Mall, <i>Fundamentals of Software Engineering</i> , 4 <sup>th</sup> ed., PHI Learning Private Limited, 2014	7. Jim Smith <i>Agile Project Management: Creating Innovative Products</i> , Pearson 2008
	4. Ramesh, Gopalaswamy, <i>Managing Global Projects</i> , Tata McGraw Hill, 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	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%
Level 2	Understand	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Level 3	Analyze	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	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. Dr. Mariappan Vaithilingam, Amazon, Bangalore	2. V. Masilamani, IIITDM, masila@iiitdm.ac.in	2. Dr. T.S. Shiny Angel, SRMIST
		3. Mr. N. Arivazhagan, SRMIST
		4. Mrs. K.R. Jansi, SRMIST

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

Pre-requisite Courses	18CSC202J	Co-requisite Courses	18CSC204J	Progressive Courses	Nil
Course Offering Department	Computer Science and Engineering		Data Book / Codes/Standards	Nil	

Course Learning Rationale (CLR):		Learning			Program Learning Outcomes (PLO)																	
The purpose of learning this course is to:		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15			
CLR-1:	Create Real-time Application Programs using structured, procedural and object oriented programming paradigms	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO - 3			
CLR-2:	Create Real-time Application Programs using event driven, declarative and imperative programming paradigms				H	H	H	H	H	H	H	-	-	L	M	M	L	M	-	M	-	-
CLR-3:	Create Real-time Application Programs using parallel, concurrent and functional programming paradigms				H	H	H	H	H	H	H	-	-	L	M	M	L	M	-	-	-	-
CLR-4:	Create Real-time Application Programs using logic, dependent type and network programming paradigms				H	H	H	H	H	H	H	-	-	L	M	M	L	M	-	-	-	-
CLR-5:	Create Real-time Application Programs using symbolic, automata based and graphical user interface program paradigm				H	H	H	H	H	H	H	-	-	L	M	M	L	M	-	-	-	-
CLR-6:	Create Real-time Application Programs using different programming paradigms using python language				H	H	H	H	H	H	H	-	-	L	M	M	L	M	-	-	-	-
Course Learning Outcomes (CLO):		At the end of this course, learners will be able to:																				
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
	SLO-2	Programming Language Theory	Event Object, handler, bind	Multi-threading, Multi-Processing	First-class function, Higher-order function, Pure functions, Recursion
S-2	SLO-1	Bohm-Jacopini structured program theorem	Keypress events, Mouse events	Serial Processing, Parallel Processing	Packages: Kanren, SymPy
	SLO-2	Sequence, selection, decision, iteration, recursion	Automatic events from a timer	Multiprocessing module in Python	PySWIP, PyDatalog
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
	SLO-2	Demo: Structured Programming in Python	Demo: Event Driven Programming in Python	Demo: Parallel Programming in Python	Demo: Logic Programming in Python
S 4-5	SLO-1	Lab 1: Structured Programming	Lab 4: Event Driven Programming	Lab 7: Parallel Programming	Lab 10: Logic Programming
	SLO-2				Lab 13: Symbolic Programming
S-6	SLO-1	Procedural Programming Paradigm	Declarative Programming Paradigm	Concurrent Programming Paradigm	Dependent Type Programming Paradigm
	SLO-2	Routines, Subroutines, functions	Sets of declarative statements	Parallel Vs Concurrent Programming	Logic Quantifier: for all, there exists
S-7	SLO-1	Using Functions in Python	Object attribute, Binding behavior	threading, multiprocessing	Dependent functions, dependent pairs
	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
S-8	SLO-1	Other languages: Bliss, ChucK, Matlab	Other languages: Prolog, Z3, LINQ, SQL	Other languages: ANI, Plaid	Other Languages: Idris, Agda, Coq
	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
S 9-10	SLO-1	Lab 2: Procedural Programming	Lab 5: Declarative Programming	Lab 8: Concurrent Programming	Lab 11: Dependent Type Programming
	SLO-2				Lab 14: Automata Programming
S-11	SLO-1	Object Oriented Programming Paradigm	Imperative Programming Paradigm	Functional Programming Paradigm	Network 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

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	4. Amit Saha, Doing Math with Python: Use Programming to Explore Algebra, Statistics, Calculus and More, Kindle Edition, 2015
	2. John Goerzen, Brandon Rhodes, Foundations of Python Network Programming: The comprehensive guide to building network applications with Python, 2 <sup>nd</sup> ed., Kindle Edition, 2010	
	3. Elliot Forbes, Learning Concurrency in Python: Build highly efficient, robust and concurrent applications, Kindle Edition, 2017	5. Alan D Moore, Python GUI Programming with Tkinter: Develop responsive and powerful GUI applications with Tkinter, Kindle Edition, 2018
		6. <a href="https://www.scipy-lectures.org/">https://www.scipy-lectures.org/</a>

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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		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)														
CLR-1:	Utilize the mathematics and engineering principles for the basics of Formal Language			1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2:	Acquire knowledge of Automata and minimize with Regular language's			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-3:	Acquire knowledge of Context free Grammar and simplify using normal forms																				
CLR-4:	Gain knowledge to push down automata and apply it with CFL																				
CLR-5:	Analyze the methods of turning machine																				
CLR-6:	Analyze and Design the methods of computational complexity																				
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																				
CLO-1:	Acquire the knowledge of mathematics and engineering principles for the basics of Formal Language			M	H	-	H	L	-	-	-	-	-	L	L	-	H	-	-	-	-
CLO-2:	Acquire the ability to identify specification of a Regular language's with Automata			M	H	L	M	L	-	-	-	-	-	M	L	-	H	-	-	-	-
CLO-3:	Acquire knowledge of Context free Grammar and simplify using normal forms			M	H	M	H	L	-	-	-	-	-	M	L	-	H	-	-	-	-
CLO-4:	Understand the concepts of push down automata and CFL.			M	H	M	H	L	-	-	-	-	-	M	L	-	H	-	-	-	-
CLO-5:	Apply the knowledge to turning machine and its methods			H	H	M	H	L	-	-	-	-	-	M	L	-	H	-	-	-	-
CLO-6:	Design the computational and acceptor machines using FA, PDA and Turing machines			L	H	-	H	L	-	-	-	-	-	L	L	-	H	-	-	-	-

Duration (hour)	11		9		9		9		7	
S-1	SLO-1	Introduction to Automaton	Grammars: Introduction: Types of Grammar	Pushdown Automata: Definitions Moves	Turing Machines: Introduction	Undecidability :Basic definitions				
	SLO-2	Mathematical concepts	Context Free Grammars and Languages	Instantaneous descriptions	Formal definition of Turing machines, Instantaneous descriptions	Decidable problems,				
S-2	SLO-1	Formal Languages: Strings, Languages, Properties	Derivations	Deterministic pushdown automata	Turing Machine as Acceptors	Examples of undecidable problems and Problems				
	SLO-2	Finite Representation : Regular Expressions	Ambiguity	Problems related to DPDA	Problems related to turning machine as Acceptors	Rice's Theorem				
S-3	SLO-1	Problems related to regular expressions	Relationship between derivation and derivation trees	Non - Deterministic pushdown automata	Problems related to turning machine as Acceptors	Undecidable problems about Turing Machine- Post's Correspondence Problem				
	SLO-2	Finite Automata :Deterministic Finite Automata	Problems related to Context free Grammar	Problems related to NDPDA		Problems related to Post's Correspondence Problem				
S-4	SLO-1	Nondeterministic Finite Automata	Simplification of CFG : Elimination of Useless Symbols	Problems related to DPDA and NDPDA	Turing Machine as a Computing Device	Properties of Recursive and Recursively enumerable languages				
	SLO-2	Finite Automaton with $\epsilon$ - 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 $\epsilon$ - 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 $\epsilon$ - 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 $\epsilon$ - 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				

<b>Learning Resources</b>	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.
	<b>Learning Assessment</b>	

	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%	-
Level 2	Understand	40 %	-	40 %	-	40 %	-	40 %	-	40%	-
Level 3	Apply	20 %	-	30 %	-	30 %	-	30 %	-	30%	-
	Analyze										
	Evaluate										
	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.,

<b>Course Designers</b>		
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	

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

<b>Course Learning Outcomes (CLO):</b>	At the end of this course, learners will be able to:
<b>CLO-1 :</b>	Acquire the basics of computer network and its architecture
<b>CLO-2 :</b>	Acquire the knowledge of various networks devices and addressing methods
<b>CLO-3 :</b>	Ability to design the network routing methods
<b>CLO-4 :</b>	Acquire the various error codes and framing concepts
<b>CLO-5 :</b>	Ability to understand the physical layer functions and components
<b>CLO-6 :</b>	Ability to design a computer network using a switch and router

Learning		
1	2	3
Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
3	80	70
3	85	75
3	75	70
3	85	80
3	85	75
3	80	70

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

Duration (hour)	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 tracer	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	Network models	Classless addressing	Distance vector routing	Error correction	Performance metrics				
S-6	SLO-1	Categories of network	Prefix usage	Node instability issues	Hamming code	Bandwidth, delay, throughput, jitter				
	SLO-2	Protocols and standards	Network Address Translation(NAT)	RIPv1	Framing	Wireless 802.11				
S-7	SLO-1	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	ARO 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	C/DR	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 model	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. Behrouz A. Forouzan, "Data Communications and Networking" 5 <sup>th</sup> edition, July 1, 2010, ISBN: 9780073376226.
	2. Todd Lammle, "CCNA Study Guide", Edition 7, 2011, ISBN: 13:9780470901076.
	3. William Stallings, "Data and Computer Communications", Edition 9, 2010.

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

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

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. Sricharan, Wipro Technologies, Chennai	1. Dr. Noor Mahammad, IIITDM, Kancheepuram, noor@iiitdm.ac.in	1. Mr. K. Venkatesh, SRMIST
2.	2.	2. Ms. D. Anitha, SRMIST
	3.	3. Ms. Ferni Ukrit, SRMIST



Course Code	18CSC303J	Course Name	DATABASE MANAGEMENT SYSTEMS	Course Category	C	Professional Core			
						L	T	P	C
						3	0	2	4

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

<b>Course Learning Rationale (CLR):</b>	The purpose of learning this course is to:	<b>Learning</b>		
<b>CLR-1 :</b>	Understand the fundamentals of Database Management Systems, Architecture and Languages	1	2	3
<b>CLR-2 :</b>	Conceive the database design process through ER Model and Relational Model	Level of Thinking (Bloom)		
<b>CLR-3 :</b>	Design Logical Database Schema and mapping it to implementation level schema through Database Language Features	Expected Proficiency (%)		
<b>CLR-4 :</b>	Familiarize queries using Structure Query Language (SQL) and PL/SQL	Expected Attainment (%)		
<b>CLR-5 :</b>	Familiarize the Improvement of the database design using normalization criteria and optimize queries			
<b>CLR-6 :</b>	Understand the practical problems of concurrency control and gain knowledge about failures and recovery			
<b>Course Learning Outcomes (CLO):</b>	At the end of this course, learners will be able to:			
<b>CLO-1 :</b>	Acquire the knowledge on DBMS Architecture and Languages	3	80	70
<b>CLO-2 :</b>	Apply the fundamentals of data models to model an application's data requirements using conceptual modeling tools like ER diagrams	3	85	75
<b>CLO-3 :</b>	Apply the method to convert the ER model to a database schemas based on the conceptual relational model	3	75	70
<b>CLO-4 :</b>	Apply the knowledge to create, store and retrieve data using Structure Query Language (SQL) and PL/SQL	3	85	80
<b>CLO-5 :</b>	Apply the knowledge to improve database design using various normalization criteria and optimize queries	3	85	75
<b>CLO-6 :</b>	Appreciate the fundamental concepts of transaction processing- concurrency control techniques and recovery procedures.	3	85	75

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

Duration (hour)	15	15	15	15	15
S-1	SLO-1	What is Database Management System	Database Design	Basics of SQL-DDL,DML,DCL,TCL	Relational Algebra – Fundamental Operators and syntax, relational algebra queries, Tuple relational calculus
	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			
S-3	SLO-1	Views of data	ER diagram	Functions-aggregation functions	Concurrency Control
	SLO-2			Built-in Functions-numeric, date, string functions, string functions, Set operations,	
S-4-5	SLO-1	Lab 1: SQL Data Definition Language Commands on sample exercise	Lab 4 : Inbuilt functions in SQL on sample exercise.	Lab 7 : Join Queries on sample exercise.	Lab 10: PL/SQL Procedures on sample exercise.
	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	
S-6	SLO-1	Database system Architecture	Keys , Attributes and Constraints	Sub Queries, correlated sub queries	Two- Phase Commit protocol, Recovery and Atomicity
	SLO-2			closure of FD set , closure of attributes	
S-7	SLO-1	Data Independence	Mapping Cardinality	Nested Queries, Views and its Types	irreducible set of FD
	SLO-2				Normalization – 1NF, 2NF, 3NF,
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.	Lab 11: PL/SQL Functions	Lab 14: PL/SQL Trigger
	SLO-2	* Identification of project Modules and functionality		* Frame and execute the appropriate In-Built functions for the project	* Frame and execute the appropriate Set Operators & Views for the project	* Frame and execute the appropriate PL/SQL Cursors and Exceptional Handling for the project
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	Lab 6: Nested Queries on sample exercise	Lab9: PL/SQL Conditional and Iterative Statements	Lab 12: PL/SQL Cursors	Lab 15 : * Frame and execute the appropriate PL/SQL Cursors and Exceptional Handling for the project * Demo of the project
	SLO-2	* Identify the issues that can arise in a business perspective for the application	* Construction of Relational Table from the ER Diagram	* Frame and execute the appropriate Nested Queries for the project	* Frame and execute the appropriate PL/SQL Conditional and Iterative Statements for the project	

Learning Resources	1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, Database System Concepts, Sixth Edition, Tata McGraw Hill, 2011.	4. Martin Gruber, Understanding SQL, Sybex, 1990
	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.	5. Sharad Maheshwari, Introduction to SQL and PL/SQL, 2 <sup>nd</sup> ed., Laxmi Publications, 2016.
	4. Rajesh Narang, Database Management Systems, 2 <sup>nd</sup> ed., PHI Learning Private Limited, 2011.	6. Raghurama Krishnan, Johannes Gehrke, Database Management Systems, 3rd Edition, McGraw Hill 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	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%
Level 2	Understand	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Level 3	Apply	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	Analyze										
	Evaluate										
	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, 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	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:	Acquire knowledge of Lexical Analyzer from a specification of a language's lexical rules				H	H	H	M	L	L	L	M	M	L	H	H	H	H	
CLR-3:	Acquire knowledge of Syntax Analyzer for parsing the sentences in a compiler grammar				H	H	H	M	L	L	L	M	M	L	H	H	H	H	
CLR-4:	Gain knowledge to translate a system into various intermediate codes				H	H	H	M	L	L	L	M	M	L	H	H	H	H	
CLR-5:	Analyze the methods of implementing a Code Generator for compilers				H	H	H	M	L	L	L	M	M	L	H	H	H	H	
CLR-6:	Analyze and Design the methods of developing a Code Optimizer				H	H	H	M	L	L	L	M	M	L	H	H	H	H	
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	3	80	70	H	H	H	H	M	L	L	L	M	M	L	H	H	H	H
CLO-1:	Acquire the knowledge of mathematics and engineering principles for the Design of Compilers	3	85	75	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	75	70	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	85	80	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	75	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	80	70	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	Lab 1 - Implementation of Lexical Analyzer	Lab 4 Elimination of Ambiguity, Left Recursion and Left Factoring	Lab 7 - Shift Reduce Parsing	Lab 10-Intermediate code generation – Postfix, Prefix	Lab 13 Implementation of DAG				
	SLO-2									
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)

<b>Learning Resources</b>	1. AlfredVAho,JefferyDullman,RaviSethi,"Compilers,Principlestechniquesandtools",Pearson Education2011	4. K.Muneeswaran,,"CompilerDesign",OxfordHigherEducation,Fourthedition2015
	2. S.GodfreyWinster,S.ArunaDevi,R.Sujatha,"CompilerDesign",YesdeePublishingPvt.Ltd,2016	5. DavidGalles,"ModernCompilerDesign",PearsonEducation,Reprint2012.
	3. WilliamM.WaiteandGerhardGoos.CompilerConstruction.Springer-Verlag,NewYork,2013.	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):		Learning			Program Learning Outcomes (PLO)																
CLR-1:		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
Provide a broad understanding of the basic techniques for building intelligent computer systems and an understanding of how AI is applied to problems.		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		
Gain knowledge in problem formulation and building intelligent agents					M	M	M	M	H	-	-	-	M	L	-	H	M	L	M	L	M
Understand the search technique procedures applied to real world problems					M	H	H	H	H	-	-	-	M	L	-	H	M	L	M	L	M
Understand the types of logic and knowledge representation schemes					M	H	M	H	H	-	-	-	M	L	-	H	M	M	M	M	M
Acquire knowledge in planning and learning algorithms					M	H	H	H	H	-	-	-	M	L	-	H	H	M	H	M	H
Gain knowledge in AI Applications and advances in Artificial Intelligence					L	H	M	M	H	-	-	-	H	L	-	H	H	M	H	M	H
Course Learning Outcomes (CLO):		Learning			Program Learning Outcomes (PLO)																
CLO-1:		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
Formulate a problem and build intelligent agents		1	80	70	M	M	M	M	H	-	-	-	M	L	-	H	M	L	M		
Apply appropriate searching techniques to solve a real world problem		2	85	75	M	H	H	H	H	-	-	-	M	L	-	H	M	L	M		
Analyze the problem and infer new knowledge using suitable knowledge representation schemes		2	75	70	M	H	H	M	H	-	-	-	M	L	-	H	M	L	M		
Develop planning and apply learning algorithms on real world problems		2	85	80	M	H	M	H	H	-	-	-	M	L	-	H	M	M	M		
Design an expert system and implement natural language processing techniques		3	85	75	M	H	H	H	H	-	-	-	M	L	-	H	H	M	H		
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	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
	SLO-2	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
S-11	SLO-1	Crypto arithmetic puzzles	Game playing and knowledge structure	Probabilistic reasoning over time	Multi_agent based learning	Business intelligence and analytics
	SLO-2	CSP as a search problem-constrains and representation	Game as a search problem-Minimax approach	Forward and backward reasoning	Ensemble learning	Sentiment Analysis
S-12	SLO-1	CSP-Backtracking, Role of heuristic	Minimax Algorithm	Other uncertain techniques-Data mining	Learning for decision making	Deep learning Algorithms
	SLO-2	CSP-Forward checking and constraint propagation	Alpha beta pruning	Fuzzy logic	Distributed learning	Deep learning Algorithms
S-13	SLO-1	CSP-Intelligent backtracking	Game theory problems	Dempster -shafer theory	Speedup learning	Planning and logic in intelligent agents
	SLO-2	Lab 3: Implementation of constraint satisfaction problems	Lab 6: Implementation of minimax algorithm for an application	Lab 9: Implementation of uncertain methods for an application	Lab12: Development of ensemble model for an application	Lab 15: Applying deep learning methods to solve an application.

Learning Resources	1. Parag Kulkarni, Prachi Joshi, Artificial Intelligence –Building Intelligent Systems, 1 <sup>st</sup> ed., PHI learning, 2015	4. Prateek Joshi, Artificial Intelligence with Python, 1 <sup>st</sup> ed., Packt Publishing, 2017
	2. Deepak Kemhani, First course in Artificial Intelligence, McGraw Hill Pvt Ltd, 2013	
	3. Stuart J. Russell, Peter Norvig, Artificial Intelligence –A Modern approach, 3 <sup>rd</sup> Pearson Education, 2016	

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	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	18CSE345T	Course Name	IOT ARCHITECTURE AND PROTOCOLS	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		

<b>Course Learning Rationale (CLR):</b>	The purpose of learning this course is to:	<b>Learning</b>			<b>Program Learning Outcomes (PLO)</b>																	
<b>CLR-1:</b>	Understand Data and Knowledge Management and use of Devices in IoT Technology.	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15			
<b>CLR-2:</b>	Understand State of the Art – IoT Architecture.	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			
<b>CLR-3:</b>	To Understand the Architectural Overview of IoT				H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>CLR-4:</b>	Understand the IoT Reference Architecture and RealWorld Design Constrains				H	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>CLR-5:</b>	To Understand the various IoT Protocols ( Datalink, Network, Transport, Session, Service)				H	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>CLR-6:</b>	Understand and apply IoT protocols appropriately				H	M	H	M	H	-	-	-	-	-	M	-	-	H	-	-	-	-
<b>CLR-6:</b>	Understand and apply IoT protocols appropriately				H	M	H	H	H	-	-	-	-	-	H	-	-	H	-	-	-	-
<b>Course Learning Outcomes (CLO):</b>	At the end of this course, learners will be able to:	2	80	85	2	75	80	2	85	80	2	80	75	2	75	85	2	80	85			
<b>CLO-1:</b>	Interpret the vision of IoT architecture from a global context.	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
<b>CLO-2:</b>	Implement state of the art architecture in IoT.	H	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
<b>CLO-3:</b>	Compare and Contrast the use of Devices, Gateways and Data Management in IoT.	H	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
<b>CLO-4:</b>	Implement using the available resources and demonstrate quick to deployment protocols wherever applicable	H	H	H	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
<b>CLO-5:</b>	Apply the protocols and Techniques towards integration in relevant areas of IoT Product development	H	M	H	M	H	-	-	-	-	-	M	-	-	H	-	-	-	-			
<b>CLO-6:</b>	Choose appropriate protocols for various layers ( Datalink, Network, Transport, Session, Service)	H	M	H	H	H	-	-	-	-	-	H	-	-	H	-	-	-	-			

Duration (hour)	9	9	9	9	9	
S-1	SLO-1 SLO-2	M2M and IoT- Relevance and Transition Building an architecture	Data Management- Introduction Managing M2M data: Data generation,	Introduction to RFID Introduction to NFC	Transport Layer Protocols -Introduction TCP	Service Layer Protocols- Introduction oneM2M
S-2	SLO-1 SLO-2	Main design principles and needed capabilities IoT architecture outline	Dataacquisition, Data validation Data storage, Data processing	WSN(Large topic), Narrow band IoT (NbiOT)	MPTCP UDP	ETSI M2M OMA
S-3	SLO-1 SLO-2	M2M and IoT Technology Fundamentals Devi ces and Gateways-Introduction	Data remanence, Data analysis Data management,	WiFi PLC Communication Protocols: A comparison	DCCP SCT	BBF Understanding Security and Interoperability
S-4	SLO-1 SLO-2	Basic Devices Gateways	Business processes in IoT Everything as a Service (XaaS)	Popular radio protocols and its security drawbacks 802.15.4 in depth	TLS DTLS	Modes of attack: DoS, Getting Access, Guess, Man in Middle, Sniff, Post Scan Modes of attack: Web Crawl, Search Features and Wild Cards, Breaking Cipher
S-5	SLO-1 SLO-2	Advanced devices Need for networking	M2M and IoT Analytics Knowledge Management	Network Layer Protocols- Introduction IPv4	Session Layer-HTTP CoAP	Tools for achieving Security: VPN, X.509, Authentication, Tools for achieving Security: User names and Passwords, Message Brokers,
S-6	SLO-1 SLO-2	State of the art-ETSI M2M IoT Reference model-IoT Domain model	Data Link Layer Protocols: PHY/MAC Layer:3GPP MTC IEEE 802.11	IPv6 6LoWPAN in depth	Implementation demo of CoAP MQTT	Tools for achieving Security: Provisioning servers, Centralization versus decentralization, The need for interoperability:
S-7	SLO-1 SLO-2	Information model Functional model	IEEE 802.15 Wireless HART	6TiSCH ND	Implementation demo of MQTT MQTT-SN	Combining Security and Interoperability Need for Security in IoT Protocols – Introduction
S-8	SLO-1 SLO-2	Communication model Safety, privacy, trust, security model	Z-Wave Bluetooth, Bluetooth Low Energy	DHCP ICMP	Implementation demo of MQTT-SN XMPP	Security in IoT Protocols :MAC 802.15.4 Security in IoT Protocols :6LoWPAN,
S-9	SLO-1 SLO-2	Introduction to Protocols- Physical, Data Link Introduction to Protocols- Network, Transport, Application	Zigbee, Zigbee Smart Energy DASH7	RPL CORPL, CARP	AMQP Introduction to Contiki- Practical demo	Security in IoT Protocols :RPL Security in IoT Protocols: Application Layer

Learning Resources	<ol style="list-style-type: none"> <li>Uckelmann, D., Harrison, M., &amp; Michahelles, F. (Eds.). <i>Architecting the Internet of Things</i>. doi:10.1007/978-3-642-19157-2, 2011</li> <li><i>IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things</i> by Rob Barton, Gonzalo Salgueiro, David Hanes, Publisher: Cisco Press, Release Date: June 2017, ISBN: 9780134307091 (<a href="https://www.oreilly.com/library/view/iot-fundamentals-networking/9780134307091/">https://www.oreilly.com/library/view/iot-fundamentals-networking/9780134307091/</a>)</li> <li>Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1<sup>st</sup> Edition, Academic Press, 2014.</li> <li>Peter Waheer, "Learning Internet of Things", PACKT publishing, BIRMINGHAM – MUMBAI</li> </ol>	<ol style="list-style-type: none"> <li>Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347-4, Willy Publications</li> </ol>
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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
Mr. Vinay Solanki, Head IoT, Lenovo (APAC & MEA)	<b>Dr.Zayaraj, Professor / CSE, PEC, Pondicherry</b>	Dr. S.Babu, SRMIST
<b>Dr. Paventhan Arumugum, Director (R&amp;D), ERNET India</b>	Dr.Vijalakshmi Associate Professor / CSE, PEC, Pondicherry	Dr.Kayalvizhi Jayavel, SRMIST
<b>Shiv Kumar Ganesh, Full Stack Developer, Altimetrik</b>	Dr.P.Yogesh, Professor/IT, Anna University, Chennai.	Mr.V.Haribaabu, SRMIST



Course Code	18CSE346T	Course Name	NETWORK PROGRAMMING	Course Category	E	Professional Elective	L	T	P	C
							3	0	0	3

Pre-requisite Courses	18CSC302J	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Engineering		Data Book / Codes/Standards	Nil	

<b>Course Learning Rationale (CLR):</b>	The purpose of learning this course is to:
<b>CLR-1:</b>	To learn different socket function and implement client server applications using sockets
<b>CLR-2:</b>	To conduct experiments to know how different internet protocols like TCP/IP works
<b>CLR-3:</b>	To analyze various application program like TELNET, DNS, DHCP
<b>CLR-4:</b>	Build different application like Routing, Load balancing & Security
<b>CLR-5:</b>	To apply protocols get adapted to emerging technologies

Learning			
	1	2	3
Level of Thinking (Bloom)	3	80	70
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	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-
Problem Analysis	M	H	L	M	L	-	-	-	M	L	-	H	-	-	-
Design & Development	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
Analysis, Design, Research	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
Modern Tool Usage	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
Society & Culture	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
Environment & Sustainability	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
Ethics	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
Individual & Team Work	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
Communication	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
Project Mgt. & Finance	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
Life Long Learning	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
PSO - 1															
PSO - 2															
PSO - 3															

<b>Course Learning Outcomes (CLO):</b>	At the end of this course, learners will be able to:
<b>CLO-1:</b>	Become familiar with elementary socket functions
<b>CLO-2:</b>	Design and implement client-server applications using Sockets
<b>CLO-3:</b>	Learn about functions that convert between names and numeric values and protocols
<b>CLO-4:</b>	Analyze network programs
<b>CLO-5:</b>	Build network applications

Duration (hour)	9	9	9	9	9
S-1	SLO-1	Introduction	Socket function	Get sock opt function	DNS
	SLO-2	simple daytime client	connect function	set sock opt function	
S-2	SLO-1	protocol independence	bind function	IPV4	IPV4
	SLO-2	Error handling	listen function	ICMP	
S-3	SLO-1	simple daytime server	accept function	TCP socket options	getservbyname
	SLO-2	Roadmap to client/server.	Fork function		getservbyport function
S 4-5	SLO1,2	Overview of TCP/IP protocol- TCP connection establishment and termination	exec function	UDP Echo server and client	tcp_connect function-
S-6	SLO-1	TCP state transition diagram – Time-wait state	concurrent servers	recvfrom function	tcp_listen function
	SLO-2	SCTP association establishment and termination	close function-getsockname and getpeername	send to function	udp_client
S-7	SLO-1	TCP port numbers and concurrent servers	TCP Echo server, TCP Echo client	Connect function with UDP	udp_connect
	SLO-2	Buffer size and limitations	normal startup and termination		udp_server function
S 8-9	SLO-1	standard internet services	POSIX signal handling, Wait and Waitpid functions	dg_cli function	BOOTP
	SLO-2	protocol usage by common, Internet applications	Termination of server process, Crashing and rebooting of server host	lack of flow control with UDP	DHCP

<b>Learning Resources</b>	<ol style="list-style-type: none"> <li>W.Richard Stevens, Bill Fenner, Andrew M. Rudoff " Unix Network programming " 3rd edition, Volume – 1, Pearson Education , 2015 R.F.Gilberg, B.A.Forouzan, Data Structures, 2<sup>nd</sup> ed., Thomson India, 2005</li> <li>Douglas.E.Comer " Internetworking with TCP/IP " principles, protocols and architecture, 6th Edition ,</li> <li>Behrouz A.Forouzan , " TCP/IP protocol suite", 4th edition, Mc Graw Hill education private limited,2010</li> <li>Wendell Odom , " IP networking ", 1st edition, Pearson Education 2012</li> </ol>
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	Volume 1, Pearson Education, 2013	
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<b>Learning Assessment</b>											
	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.,

<b>Course Designers</b>		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
<i>Dr. Viswanadham, Teken BIM Technologies Pvt. Ltd, 9962514477, Viswanathan_alladi@yahoo.com</i>	<i>Dr. Latha, Prof &amp; Head, CSE dept, SAIRAM engg college, latha.cse@sairam.edu.in, 8754502224</i>	<i>1. Mrs T. Manoranjitham, SRMIST</i>
		<i>2. Mr. Godwin, SRMIST</i>
		<i>3. Ms. Vinoth, SRMIST</i>



Learning Resources	<ol style="list-style-type: none"> <li>1. MouricioArregoces,"Data Centre Fundamentals",CiscoPress,2003</li> <li>2. SilvanoGai,Claudio DeSanti,"I/O Consolidation in the Data Center" Cisco Press;1 edition [ISBN:9781587058882].2009.</li> <li>3. KevinCorbin,Ron Fuller,DavidJansen,"NX-OSand CiscoNexus Switching:Next-Generation Data Center Architectures"CiscoPress;1 edition [ISBN:9781587058929],2010.</li> <li>4. Silvano Gai, Tommi Salli, RogerAndersson,"Cisco Unified Computing System" CiscoPress;1edition,[ISBN:9781587141935],2010.</li> <li>5. NashDarukhanawalla,Patrice Bellagamba,"Interconnecting Data Centers Using VPLS"CiscoPress;1edition,[ISBN:9781587059926],2009.</li> <li>6. RobertW.Kembel,Roger Cummings(Introduction),"The Fibre Channel Consultant" Northwest Learning Assoc:3rdedition,[ISBN:0931836840],1998.</li> <li>7. Robert W Kembal"FiberChannelSwitchedFabric"Northwest Learning Associates,inc.[ISBN:0931836719],2009.</li> <li>8. JohnL.Hufferd,"ISCSI",Addison-WesleyBoston[ISBN:978-0201784190],2003.</li> </ol>
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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



<b>Learning Resources</b>	1. David Kriesel, <i>A Brief Introduction to Neural Networks</i> , dkriesel.com, 2005	3. Raul Rojas, <i>Neural Networks: A Systematic Introduction</i> , 1996.
	2. Gunjan Goswami, <i>Introduction to Artificial Neural Networks</i> , S.K. Kataria & Sons, 2012	4. S. Sivanandam, <i>Introduction to Artificial Neural Networks</i> , 2003

<b>Learning Assessment</b>											
	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%	-
	<b>Total</b>	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.,

<b>Course Designers</b>		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. 1. Dr. Harisekharan, CTO, Sri Seshaa Technologies Pvt. Ltd., Chennai	1. Dr. J. Suresh, SSN College of Engineering	Dr. G. Vadivu
	2. Dr. Sharmila Shankar, Crescent Institute of Science and Technology	Dr. D. Rajeswari
		Dr. M. S. Abirami

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

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

<b>Course Learning Rationale (CLR):</b>	The purpose of learning this course is to:			<b>Learning</b>			<b>Program Learning Outcomes (PLO)</b>																
<b>CLR-1 :</b>	To provide basic concepts of machine learning			1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
<b>CLR-2 :</b>	To provide deeper understanding of various tools and techniques for Machine learning Algorithms and outputs			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			
<b>CLR-3 :</b>	Understand and Implement the major classification techniques																						
<b>CLR-4 :</b>	Understand and Implement the various Clustering Methods																						
<b>CLR-5 :</b>	Learn and Understand the Tree based machine Learning Algorithms																						
<b>Course Learning Outcomes (CLO):</b>	At the end of this course, learners will be able to:																						
<b>CLO-1 :</b>	Understand the concepts of machine learning			2	80	85	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>CLO-2 :</b>	Learn and understand machine tools and libraries of machine learning			2	75	80	H	H	H	-	H	-	-	-	-	-	-	-	-	-	-	-	
<b>CLO-3 :</b>	Learn and understand the linear learning models and classification in machine learning			2	85	80	H	H	-	-	H	-	-	-	-	-	-	-	-	-	-	-	
<b>CLO-4 :</b>	Understand the clustering techniques and their utilization in machine learning			2	80	75	H	H	-	-	H	-	-	-	-	-	-	-	-	-	-	-	
<b>CLO-5 :</b>	Study the tree based machine learning techniques and to appreciate their capability			2	75	85	H	H	-	H	H	-	-	-	-	-	-	-	-	-	-	-	

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

Learning Resources	<ol style="list-style-type: none"> <li>Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012.</li> <li>Ethem Alpaydin, "Introduction to Machine Learning", Prentice Hall of India, 2005</li> <li>Tom Mitchell, "Machine Learning", McGraw-Hill, 1997.</li> </ol>	<ol style="list-style-type: none"> <li>Sebastian Raschka, Vahid Mirjalili, "Python Machine Learning and deep learning", 2<sup>nd</sup> edition, kindle book, 2018</li> <li>Carol Quados, "Machine Learning with python, scikit-learn and Tensorflow", Packet Publishing, 2018.</li> <li>Gavin Hackeling, "Machine Learning with scikit-learn", Packet publishing, O'Reilly, 2018.</li> </ol>
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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
		<i>Dr.G.Vadivu</i> <i>Dr. UshaKiruthika</i> <i>Mr.S.Joseph James</i>



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		

<b>Course Learning Rationale (CLR):</b>	The purpose of learning this course is to:	<b>Learning</b>		
<b>CLR-1 :</b>	Understand basic sensor network concepts	1	2	3
<b>CLR-2 :</b>	Know physical layer issues, Medium Access Control Protocols			
<b>CLR-3 :</b>	Comprehend network and transport layer characteristics and protocols			
<b>CLR-4 :</b>	Understand the network management and Middleware services			
<b>Course Learning Outcomes (CLO):</b>	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
<b>CLO-1 :</b>	Understand the basic ideas about sensor network concepts with Applications and Apply the knowledge for WSN tools	2	80	85
<b>CLO-2 :</b>	Acquire the knowledge on wireless transmission technology ,hardware and Medium Access Protocols	2	75	80
<b>CLO-3 :</b>	Understand the basic ideas about Wireless Sensor Networks Routing protocols and network - transport layer characteristics	2	85	80
<b>CLO-4 :</b>	Apply the knowledge for network management and Middleware services	2	80	75

Program Learning Outcomes (PLO)														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO - 3
H	H	H	H	M	M	M	M	H	M	H	L	H	H	H
H	H	H	H	M	M	M	M	M	H	L	H	H	H	H
H	H	H	H	M	M	M	M	M	H	L	H	H	H	H
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
	SLO-2				Routing Challenges in WSN
S-2	SLO-1	Motivation for a network of Wireless Sensor nodes - Sensing and sensors	Radio Technology Primer	Characteristics of MAC protocols in Sensor networks	Flooding
	SLO-2		Available Wireless Technologies		Middleware architecture
S-3	SLO-1	Challenges and constraints	Hardware- Telosb	Contention free MAC Protocols	Flat Based Routing – SAR
	SLO-2				Directed Diffusion
S-4	SLO-1	Node architecture	Hardware -Micaz notes	MAC Protocols -Characteristics	MCFA Coherent processing
	SLO-2	Sensing sub system		Traffic Adaptive Medium Access	Non-Coherent Processing
S-5	SLO-1	Processor sub system	Time Synchronization- Clock	Y-MAC	Hierarchical Routing- LEACH,TEEN, APTEEN,PEGASIS
	SLO-2	Communication interfaces-- prototypes		Low energy Adaptive Clustering	Operating systems for wireless sensor networks
S-6	SLO-1	Application of Wireless sensors	Synchronization Problems	Contention based MAC Protocols	Query Based Routing
	SLO-2				Negotiation Based Routing
S-7	SLO-1	WSN Tools- Overview and Limitations	Basics of time synchronization	Sensor MAC	Geographical Based Routing
	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
	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
	SLO-2		Event driven Localization		

<b>Learning Resources</b>	<ol style="list-style-type: none"> <li>1. Kazem Sohraby, Daniel manoli , "Wireless Sensor networks- Technology, Protocols and Applications", Wiley InterScience Publications 2013.</li> <li>2. Waltenequs Dargie, Christian Poellabauer , "Fundamentals of Wireless Sensor Networks, Theory and Practice", Wiley Series on wireless Communication and Mobile Computing, 2011</li> <li>3. S.Swapna Kumar, "A Guide to Wireless Sensor Networks", kindle Edition, USP publications,2017</li> <li>4. C.S Raghavendra, Krishna M.Sivalingam, Taieb znati , "Wireless Sensor Networks", Springer Science 2010.</li> </ol>	<ol style="list-style-type: none"> <li>5. Bhaskar Krishnamachari , " Networking Wireless Sensors", Cambridge University Press, 2005</li> <li>6. <a href="https://www.amazon.in/Guide-Wireless-Sensor-Networks-ebook/dp/B072R53JJM">https://www.amazon.in/Guide-Wireless-Sensor-Networks-ebook/dp/B072R53JJM</a></li> <li>7. <a href="https://anrg.usc.edu/contiki/index.php/Contiki_tutorials">https://anrg.usc.edu/contiki/index.php/Contiki_tutorials</a></li> <li>8. <a href="file:///C:/Users/Administrator.RD27/Downloads/Fundamentals-of-Wireless-Sensor-Networks-Waltenequs-Dargie.pdf">file:///C:/Users/Administrator.RD27/Downloads/Fundamentals-of-Wireless-Sensor-Networks-Waltenequs-Dargie.pdf</a></li> </ol>
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<b>Learning Assessment</b>											
	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%	-
Level 2	Understand	40 %	-	40 %	-	40 %	-	40 %	-	40%	-
	Apply										
Level 3	Analyze	20 %	-	30 %	-	30 %	-	30 %	-	30%	-
	Evaluate										
	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.,

<b>Course Designers</b>		
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	<ol style="list-style-type: none"> <li>1. Dr. Revathi Venkatraman, <b>SRMIST</b></li> <li>2. Dr.N.Snehalatha, <b>SRMIST</b></li> <li>3. Dr.MB.Mukesh krishnan, <b>SRMIST</b></li> </ol>

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)														
CLR-1 :	CLR-2 :	CLR-3 :	CLR-4 :	CLR-5 :	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
cover topics more advanced than a typical undergraduate networking course	prepare students for a market that is going to demand computer scientists and software engineers to deliver the next generation of network switches	describe the principles by which large computer networks and applications atop them are designed and maintained	Make students understand the state-of-the-art networking technologies proposed in literature or used throughout industry in a variety of areas	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	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 :	CLO-2 :	CLO-3 :	CLO-4 :					H	M	H	-	H	-	-	-	-	-	-	H	H	H	H
have a knowledge of the technology evolution leading to SDN as well as the Open Source role in SDN and OpenFlow specifications	gain a knowledge of the advantages and disadvantages of SDN, API approaches, Hypervisor overlays, and Data Center SDN, SDN WAN etc	Understand different network virtualization techniques and can deploy SDN/NFV applications	understand the economics of SDN and its impacts in the marketplace					H	M	H	-	H	-	-	-	-	-	-	H	H	H	H
								H	M	H	-	H	-	-	-	-	-	-	H	H	H	H
								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
	SLO-2	How to Read a Paper (S. Keshav)	How SDN Works	Potential drawbacks of Open SDN	Protocol Models: NETCONF, BGP, MPLS
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
	SLO-2	Networking Basics: Switching, Addressing, Routing	SDN Architecture	SDN via Hypervisor-Based Overlays	Application Models: Proactive, Declarative, External
S-3	SLO-1	Paper Reading: 4D	Plane Separation	SDN via Opening Up the Device	SDN in Datacenters: Multitenancy, Failure Recovery
	SLO-2	Paper Reading: 4D	Simple Device and Centralized Control	Building our own SDN Switch	SDN in Internet eXchange Points (IXPs)
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
	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
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
	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. <i>Software Defined Networks: A Comprehensive Approach, 2nd Edition Morgan Kaufmann, 2016</i>	3. <i>Network Function Virtualization, Ken Gray, Thomas D. Nadeau, Morgan Kaufmann, 2016</i>
	2. <i>SDN: Software Defined Networks, Thomas D. Nadeau, Ken Gray, O'Reilly Media, 2013.</i>	

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%	-
Level 2	Understand	40 %	-	40 %	-	40 %	-	40 %	-	40%	-
Level 3	Apply	20 %	-	30 %	-	30 %	-	30 %	-	30%	-
	Analyze										
	Evaluate										
	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. <b>Dr. Femilda</b>
		2. <b>Mr. K. Venkatesh</b>
		3. <b>Mr. KarthickNanmaran</b>

Course Code	18CSE445T	Course Name	IOT SECURITY	Course Category	E	Professional Elective	L	T	P	C
							3	0	0	3

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning			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, various attacks and importance of Security aspects in IoT	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 :	Understand the techniques, protocols and some idea on security towards Gaming models				L	H	M	H	M	-	-	-	M	L	-	H	-	-	-	-	-	-
CLR-3 :	Understand the relevance of Blockchain, its techniques towards IoT				H	H	M	H	H	-	-	-	M	L	-	H	-	-	-	-	-	-
CLR-4 :	Understand the operations of Bitcoin blockchain, crypto-currency as application of blockchain technology				L	M	M	M	M	-	-	-	M	L	-	H	-	-	-	-	-	-
CLR-5 :	Understand the essential components of IoT				M	H	M	H	M	-	-	-	M	L	-	H	-	-	-	-	-	-
CLR-6 :	Understand security and privacy challenges of IoT																					
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																					
CLO-1 :	Incorporate the best practices learnt to identify the attacks and mitigate the same	3	80	70																		
CLO-2 :	Adopt the right security techniques and protocols during the design of IoT products	3	85	75																		
CLO-3 :	Apply the skills learnt towards gaming designs	3	75	70																		
CLO-4 :	Assimilate and apply the skills learnt on ciphers and blockchains when appropriate	3	85	80																		
CLO-5 :	Be able to describe the essential components of IoT	3	85	75																		
CLO-6 :	Be able to find appropriate security/privacy solutions for IoT	3	80	70																		

Duration (hour)	9	9	9	9	9	
S-1	SLO-1	Fundamentals of IoT and Security and its need	Prevent Unauthorized Access to Sensor Data	Block ciphers	Introduction to Blockchain	Introduction of IoT devices
	SLO-2	IoT Security Requirements	M2M Security,	Message integrity	Modeling faults and adversaries	Difference among IoT devices, computers, and embedded devices.
S-2	SLO-1	IoT and cyber-physical systems	RFID Security,	Authenticated encryption	Byzantine Generals problem	sensors and actuators in IoT
	SLO-2	IoT security (vulnerabilities, attacks, and countermeasures),	Cyber Physical Object Security, ,	Hash functions	Consensus algorithms and their scalability problems	Accelerometer, photoresistor, buttons
S-3	SLO-1	Security engineering for IoT development	Hardware Security,	Merkle trees and Elliptic curves	digital signatures, verifiable random functions, Zero-knowledge systems	motor, LED, vibrator,
	SLO-2	IoT security lifecycle	Front-end System Privacy Protection, Management, Secure IoT Databases	Public-key crypto (PKI),	blockchain, the challenges, and solutions,	analog signal vs. digital signal
	SLO-2					
S-4	SLO-1	Data Privacy	Networking Function Security	Trees signature algorithms	proof of work, Proof of stake,	Networking in IoT
	SLO-2	Device/User Authentication in IoT	IoT Networking Protocols,	Crypto-currencies,	alternatives to Bitcoin consensus, Bitcoin scripting language and their use	Real-time communication
S-5	SLO-1	Introduction to Authentication Techniques	Secure IoT Lower Layers,	Bitcoin P2P network,	Ethereum and Smart Contracts,	Bandwidth efficiency
	SLO-2	Data Trustworthiness in IoT	Secure IoT Higher Layers,	Distributed consensus, , ,	Smart Contract Languages and verification challenges	data analytics in IoT - simple data analyzing methods
S-6	SLO-1	Human IoT Trust Relationship	Secure Communication	Incentives and proof-of-work	comparing Bitcoin scripting vs. Ethereum Smart Contracts	IoT architecture, component and technology
	SLO-2	Trust and Reputation Systems	Links in IoTs, Back-end Security - Secure Resource	Mining, scripts and smart contracts	Hyperledger fabric	Case study: discussion on specific IoT applications and their design considerations

	SLO-2					
S-7	SLO-1	Trust Negotiation	Game Theory Foundation	Wallets: hot and cold storage ,anonymity, altcoins	Mechanisms in permissioned blockchain	cybersecurity overview in IoT
	SLO-2	IoT Privacy Preservation Issues	Mixed-strategy, ,	Credential management for connected devices: Security credential management system (SCMS),	Pseudo-anonymity vs. anonymity	General cybersecurity concepts in IoT
S-8	SLO-1	Attack Models - Attacks to Sensors in IoTs,	Nash equilibrium	VehicleBased Security System (VBSS),	Zcash and Zk-SNARKS for anonymity preservation	security threats in IoT
	SLO-2	Attacks to RFIDs in IoTs,	Repeated games	PKI design, Certification provisioning	Attacks on Blockchains	data privacy in IoT
S-9	SLO-1	Attacks to Network Functions in IoTs,	Bayesian games	Pseudonyms (privacy-by design),	Sybil attacks, selfish mining	device/User authentication in IoT
	SLO-2	Attacks to Back-end Systems and security in Front end Systems	Coalitional games.	Misbehavior detection and Revocation,	51% attacks	data trustworthiness problem in IoT

Learning Resources	<ol style="list-style-type: none"> <li>1. B. Rusell and D. Van Duren, "Practical Internet of Things Security," Packt Publishing, 2016.</li> <li>2. Fei HU, "Security and Privacy in Internet of Things (IoT): Models, Algorithms, and Implementations", CRC Press, 2016</li> <li>3. Narayanan et al., "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction," Princeton University Press, 2016.</li> <li>4. A. Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies," O'Reilly, 2014.</li> </ol>	<ol style="list-style-type: none"> <li>5. T. Alpcan and T. Basar, "Network Security: A Decision and Game-theoretic Approach," Cambridge University Press, 2011.</li> <li>6. Security and the IoT ecosystem, KPMG International, 2015</li> <li>7. Internet of Things: IoT Governance, Privacy and Security Issues" by European Research Cluster</li> <li>8. Ollie Whitehouse, "Security of Things: An Implementers' Guide to Cyber-Security for Internet of Things Devices and Beyond", NCC Group, 2014</li> <li>9. Josh Thompson, "Blockchain: The Blockchain for Beginners, Guild to Blockchain Technology and Blockchain Programming", CreateSpace Independent Publishing Platform, 2017.</li> </ol>
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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.A.Amuthan, Associate Dean, Dept. of CSE, Pondicherry Engg. College, Pondicherry	Dr.M.Murali Dr.Kayalvizhi Jayavel Mr. H.Karthikeyan

Course Code	18CSE446T	Course Name	ADVANCED DATABASE 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:	Familiarize with the various query processing, join and optimization techniques		
CLR-2:	Improve their ability to choose the appropriate techniques for any parallel and distributed database systems		
CLR-3:	Familiarize with the various object based databases techniques		
CLR-4:	Familiarize with the various Motivation, Structure, Storage, Application and Evaluation of XML Queries		
CLR-5:	Expose to the concepts of Performance Tuning, Temporal, Spatial, Multimedia and Mobile data bases		
CLR-6:	Expose to the latest Spatial and Geographic data, R Trees and Multimedia databases		

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:			
CLO-1:	Acquire the knowledge on query processing, join and optimization on a database	2	80	85
CLO-2:	Acquire the ability to identify & design a parralel and distributed database	2	75	80
CLO-3:	Understand the basic ideas about various object based databases	2	85	80
CLO-4:	Apply the knowledge of XML on various applications	2	80	75
CLO-5:	Appreciate the concepts of Performance Tuning, Temporal, Spatial, Multimedia and Mobile data bases	2	75	85
CLO-6:	Appreciate the concepts of latest Spatial and Geographic data, R Trees and Multimedia databases	2	80	85

Learning	Program Learning Outcomes (PLO)														
	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	H	H	L	M	L	-	-	-	M	M	M	-	-	-	-
Problem Analysis	H	H	L	M	L	-	-	-	M	M	M	-	-	-	-
Design & Development	H	H	L	M	L	-	-	-	M	M	M	-	-	-	-
Analysis, Design, Research	H	H	L	M	L	-	-	-	M	M	M	-	-	-	-
Modern Tool Usage	H	H	L	M	L	-	-	-	M	M	M	-	-	-	-
Society & Culture	H	H	L	M	L	-	-	-	M	M	M	-	-	-	-
Environment & Sustainability	H	H	L	M	L	-	-	-	M	M	M	-	-	-	-
Ethics	H	H	L	M	L	-	-	-	M	M	M	-	-	-	-
Individual & Team Work	H	H	L	M	L	-	-	-	M	M	M	-	-	-	-
Communication	H	H	L	M	L	-	-	-	M	M	M	-	-	-	-
Project Mgt. & Finance	H	H	L	M	L	-	-	-	M	M	M	-	-	-	-
Life Long learning	H	H	L	M	L	-	-	-	M	M	M	-	-	-	-
PSO-1	H	H	L	M	L	-	-	-	M	M	M	-	-	-	-
PSO-2	H	H	L	M	L	-	-	-	M	M	M	-	-	-	-
PSO-3	H	H	L	M	L	-	-	-	M	M	M	-	-	-	-

Duration (hour)	9		9		9		9		9	
S-1	SLO-1	Overview of query processing	Introduction to Parallel Databases		Overview of object based databases		Introduction to XML		Performance Tuning	
	SLO-2	Measures of query cost	I/O parallelism		Complex data types				Improving set orientation	
S-2	SLO-1	Selection Operation	Interquery Parallelis		Structured types in SQL		Motivation		Tuning of bulk loads and updates	
	SLO-2	Sorting	Intraquery Parallelism		Inheritance in SQL				Location of bottlenecks	
S-3	SLO-1	Join Operation-Nested loop join	Intraoperation Parallelism		Table inheritance		Structure of XML data		Tunable parameters	
	SLO-2	Merge join and Hash join	Interoperation Parallelism						Tuning of hardware	
S-4	SLO-1	Projection, set operation, Outer join and Aggregation	Query Optimization		Array and multiset Types in SQL		XML document scheme		Tuning of the schema and Indices	
	SLO-2	Evaluation of Expressions	Design of Parallel Systems						Tuning of Physical design	
S-5	SLO-1	Overview of query optimization	Homogeneous and heterogeneous database		Object –identity and reference Types in SQL		Querying and transformation		Tuning of concurrent transactions	
	SLO-2	Transformation of relational expressions -Equivalence Rules	Distributed data Storage						Introduction to Temporal, Spatial, Multimedia and Mobile data bases	
S-6	SLO-1	Join Ordering	Distributed transactions		Implementing O-R features		Application program interface to XML		Performance benchmarks	
	SLO-2	Enumeration of Equivalent Expression	Commit protocols						Time in databases	
S-7	SLO-1	Estimating statistics of expression results Catalog Information	Concurrency control in distributed databases		Persistent programming languages – Persistence of objects		Storage of XML data		Spatial and Geographic data	
	SLO-2	Selection Size and Join size Estimation	Distributed query processing		Object identity and pointers				Representation of Geographic data	
S-8	SLO-1	Size Estimation for other Operation, Estimation of Number of Distinct Values	Availability		Persistent C++ systems		XML applications.		Spatial Queries	
	SLO-2	Choice of evaluation plans-Cost based join order Selection			Persistent Java systems				Indexing of Spatial Data	
S-9	SLO-1	Cost based optimization with equivalence rules	Heterogeneous distributed databases.		Object-relational mapping		Evaluation of XML Queries		R Trees	
	SLO-2	Heuristics in optimization, Optimizing Nested Sub queries			Object-oriented versus object-relational.				Multimedia databases	

<b>Learning Resources</b>	1. Abraham Silberschatz, Henry F Korth, S Sudarshan, "Database System Concepts", McGraw Hill Education –2013	3. Elmasri Navathe, Somayajulu, Gupta, "Fundamentals of Database Systems, Pearson Education, 4 <sup>th</sup> Edition, 2006
	2. Raghu Ramakrisnan, "Database Management Systems", - McGrawHill Education-2014	4. CJ Date, AKannan, SSwamynathan, "An Introduction to Database Systems", Pearson Education, 8 <sup>th</sup> Edition, 2006

<b>Learning Assessment</b>											
	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.,

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



Course Code	18CSE447T	Course Name	EDGE 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		

<b>Course Learning Rationale (CLR):</b>	The purpose of learning this course is to:			<b>Program Learning Outcomes (PLO)</b>																			
<b>CLR-1:</b>	Understand the concepts of IoT			1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
<b>CLR-2:</b>	Understand the IoT and M2M communication			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		
<b>CLR-3:</b>	Understand the protocols and standards of IoT						H	L	H	M	H	H	H	H	H	H	H	M	H	H	H	H	H
<b>CLR-4:</b>	Understand the Fog computing Architecture and its components						H	L	H	M	H	H	H	H	H	H	H	M	H	H	H	H	H
<b>CLR-5:</b>	Understand the integration of Fog and Cloud Computing						H	L	H	M	H	H	H	H	H	H	H	M	H	H	H	H	H
<b>CLR-5:</b>	Understand the integration of Fog and Cloud Computing						H	L	H	M	H	H	H	H	H	H	H	M	H	H	H	H	H
<b>Course Learning Outcomes (CLO):</b>	At the end of this course, learners will be able to:																						
<b>CLO-1:</b>	Apply concepts of IoT			3	80	70																	
<b>CLO-2:</b>	Apply the M2M protocol in IoT.			3	85	75																	
<b>CLO-3:</b>	Equip themselves familiar with Fog computing in IoT			3	75	70																	
<b>CLO-4:</b>	Familiarize with IoT standard and protocols			3	85	80																	
<b>CLO-5:</b>	Acquaint with Fog and Cloud computing in IoT			3	85	75																	

Duration (hour)	9		9		9		9		9	
S-1	SLO-1	Introduction to IoT	IoT Architecture	Fog Computational Model	BIG DATA	Case Study-1: Edge analytics in Irrigation System				
	SLO-2	Technologies in IoT	Data Acquisition, Data Aggregation and Data Analysis	Fog Simulators	Data Types in Big data	Machine Learning in Edge for automation in Irrigation system				
S-2	SLO-1	IoT Applications- Smart Home, Wearable, Connected Cars, Industrial IoT	IoT Protocols- COAP, MQTT	iFogSim	Characteristics of BIG DATA	Case study 2: Edge analytics for Water Quality Monitoring				
	SLO-2	Smart Cities, Agriculture, Smart Retail, smart Grid, Healthcare	XMPP, AMQP, Low power Lossy Network routing	FogTorch	Benefits of Big Data	Machine Learning in Edge for automation in water quality monitoring				
S-3	SLO-1	Challenges in IoT- Delivering Value to Customers, Hardware Compatibility Issues, Data Connectivity Issues	Communication Methods- Bluetooth, Zigbee, Z-wave, 6LowPAN	Cisco IoT and Fog Application	Big Data Application-	Case Study 3: IoT- Edge system for Hydroponics system				
	SLO-2	Incorrect Data Capture Capabilities, Analytic Challenges, Data Security challenges,	Wireless Fidelity	Contiki/Cooja	Layered Big Data Architecture- Data Ingestion, Data collection, Data Processing Layer	Deep Learning in Edge for automation in hydroponics system				
S-4,5	SLO-1	Introduction to Edge Computing	4G	NS3	Data storage, Data Query and Visualization Layer	Case Study 4: IoT-Edge for Smart Energy Management				
	SLO-2	Need for Edge Computing- Improved Performance, Compliance, Data Privacy, And Data Security	Sigfox, NeUL	Software Defined Multi-Tier Fog Architecture	Big Data Implementation- Hortonworks, Cloudera, MAP R	Case Study 5: IoT- Edge for water demand forecasting				
S-6,7	SLO-1	Reduced Operational Cost	LoRaWAN	PVFOg simulator	Apache Projects for Big Data	Demand forecasting at Edge				
	SLO-2	Challenges in Edge/Fog Computing	5G	System Model analysis	Edge Computing for Big Data					

**Learning Resources**

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- Maria Rita Palattella et al., (2013), "Standardized protocol stack for the internet of (important) things," IEEE Communications Surveys and Tutorials, 15(3), pp. 1389-1406.
- D. Airehour, J. Gutierrez and S. K. Ray, (2016), "Secure routing for internet of things: A survey," Journal of Network and Computer Applications, 66, pp. 198-213.
- Reem Abdul Rahman and Babar Shah, (2016), "Security analysis of IoT protocols: A focus in CoAP," 2016 3rd MEC International Conference on Big Data and Smart City, ICBDS 2016, pp. 172-178..
- Flavio Bonomi, Rodolfo Milito, Jiang Zhu and Sateesh Addepalli, (2012), "Fog Computing and Its Role in the Internet of Things," Proceedings of the first edition of the MCC workshop on Mobile cloud computing, pp. 13-16.

6. Weisong Shi, Jie Cao, Quan Zhang, Youhui Li and Lanyu Xu, (2016), "Edge Computing: Vision and Challenges," IEEE Internet of Things Journal, 3(5), pp. 637–646.
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Learning Assessment											
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		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	Dr.Subra Ganesan	Dr.S.Suresh
Senior Scientist	Professor, Department of Electrical and Computer Engineering	Dr.J. Sujithra
CEERI, CSIR, Chennai (R&D Industry)	Oakland University, USA	



S-6	SLO-1	Harvesting modules		Particle Swarm Optimization (PSO)	IoT Based Smart Metering	Potential of EV to Grid Connection, Capacity Estimation of Aggregator
	SLO-2	Rectenna Model	Static Algorithms, Dynamic Algorithms	Ant Colony Optimization (ACO)	Communication Technology Creating Awareness About Green Information, Promoting Recycling	Battery Management System, Grid Connection and Performance Testing of V2G
S-7	SLO-1	Sensing antenna	Issues of energy conservation in IoT	Simulated Annealing (SA)	Habitual Based Techniques	Weather monitoring using Bluetooth Low Energy (BLE) in warehouses
	SLO-2	DC-DC Converter		Cat Swarm Optimization(CSO)	Comparative analysis of different green IoT approaches	BLE Introduction
S-8	SLO-1	Wireless energy harvesting	Basic model of smart home system	Hybrid Genetic Algorithm and Cat Swarm Optimization (HGACSO)	Case study: impact of smart phones on the environment in present and future trends	BLE importance
	SLO-2	Near Field Communication, Inductive coupling	Energy Conservation in Smart Home and IoT	Hybrid Genetic Algorithm, Particle Swarm Optimization and Simulated annealing(HGAPSOSA)	Reduce the environmental impact life cycle assesment of smatphones, smart phone emission and selling rate	Challenges in BLE
S-9	SLO-1	Paradigmatic view of energy efficient IoT	Automation and Sensors in Smart Home	Comparison of dynamic energy efficient algorithms	Promoting the Usage of Sensor Cloud: a step toward green IoT.	Design weather monitoring using BLE
	SLO-2	Pragmatic energy efficient IoT system architecture	Case study: energy conservation component for smart home.	Compare and contrast static and dynamic energy efficient algorithms	Creating Awareness Through Prototyping: A Green IoT-Based Smart	

<b>Learning Resources</b>	1. 1."Energy Conservation for IoT Devices Concepts, Paradigms and Solutions", Mamta Mittal, Sudeep Tanwar, Basant Agarwal, Lalit Mohan Goyal, Studies in Systems, Decision and Control 206, 2019.	1. Green IoT: An Investigation on Energy Saving Practices for 2020 and Beyond, Rushan Arshad, Saman Zahoor, Munam Ali Shah, Abdul Wahid, and Hongnian Yu, special section on future networks: architectures, protocols, and applications, 2017.
	2. 2."IoT projects with Bluetooth Low Energy- Harness the power of connected things", Madhur	

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 %	

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<b>Course Designers</b>		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1.Mr.Anantha Velavan , Principal Validation Engineer, Micro chip	Dr. Divya Udayan J, PhD(S.Korea)   MIEEE   MACM   MIDF, Associate Professor, VIT University, Vellore	Dr.T.Sujithra, SRMIST
2.Mr.GaneshSKandha, Senior Applications Engineer, Micro chip	Dr.Masoodhu Banu, Professor/Head of Bio Medical, Veltech University,	Dr.Kayalvizhi Jayavel, SRMIST
		Mrs.Anitha, SRMIST

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):		Learning			Program Learning Outcomes (PLO)														
CLR-1:		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
The purpose of learning this course is to:																			
Analyze the fundamental of transmission and cellular systems																			
Apply skills in real time engineering problems and can have capability to evaluate the transmission errors																			
Comprehend the concept of mobile network, transport layer and wireless technologies																			
Differentiate the various types of cellular standard by their unique services.																			
Grasp GSM, GPRS, Handover and Localization techniques																			
Apply skills in various Routing protocols																			
Course Learning Outcomes (CLO):		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
At the end of this course, learners will be able to:																			
Apply Wireless Technology concepts to Engineering problems related to communication		3	80	70	H	H	H	H	H	H	H	H	H	H	M	H	H	H	H
Improve their knowledge on Digital and analog Modulation techniques.		3	85	75	H	H	H	H	H	H	H	H	H	H	M	H	H	H	H
Equip themselves familiar with principle of Mobile Communication		3	75	70	H	H	H	H	H	H	H	H	H	H	M	H	H	H	H
Familiarize with Digital Cellular Standards		3	85	80	H	H	H	H	H	H	H	H	H	H	M	H	H	H	H
Acquaint with routing protocols		3	85	75	H	H	H	H	H	H	H	H	H	H	M	H	H	H	H
Expose to the emerging wireless technologies		3	80	70	H	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 Frequency division 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	GPS/Beneficiaries 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
	SLO-2	Direct Sequence Spread spectrum		4G Standards (LTE/WiMax)	Push Architecture	Push-to-talk technology for SMS

Learning Resources	<ol style="list-style-type: none"> <li>Roy Blake, "Wireless Communication Technology" CENGAGE learning, Sixth indian reprint 2013.</li> <li>Dharma Prakash Agarwal, Qing-An Zeng, "Introduction to Wireless and Mobile Systems" CENGAGE learning, First edition 2014.</li> <li>Jochen Schiller, "Mobile Communications", Addison Wesley, 2<sup>nd</sup> edition 2011.</li> <li>Singal TL, "Wireless Communication", Tata McGraw Hill Education Private Limited.</li> <li>G.I.Papadimitriou, A.S.Pomportsis, P.Nicopolitidis, M.S.Obaidat, "Wireless Networks", John Wiley and Sons, 2003</li> </ol>	<ol style="list-style-type: none"> <li>Gray J.Mullet "Wireless Telecommunication System and Networks", CENGAGE learning, reprint 2014.</li> <li>Upena Dalal, "Wireless Communication" Oxford University Press, First edition 2009.</li> <li>Kaveh Pahlavan &amp; Prashant Krishnamurthy, "Wireless Networks" PHI 2002.</li> <li>Martyn Mallick, "Mobile and Wireless Design Essentials", Wiley Dreamtech India Pvt.Ltd., 2014.</li> </ol>
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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.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	18CSE490T	Course Name	BIG DATA VISUALIZATION	Course Category	E	Professional Elective	L	T	P	C
							3	0	0	3

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

Course Learning Rationale (CLR):		The purpose of learning this course is to:			Learning			Program Learning Outcomes (PLO)																																			
CLR-1:	CLR-2:	CLR-3:	CLR-4:	CLR-5:	CLR-6:	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15																				
Understand the key techniques used in visualization which includes data models, graphical perception and techniques specifically for visual encoding and interaction	Obtain an exposure to common data domains and the corresponding analysis tasks which includes multivariate data and text	Get hands-on experience in building and evaluating visualization systems	Gain knowledge in data visualization aides	Understand the significance of data by placing it in a visual context	Utilize the knowledge by reading and discussing research papers from the visualization literature	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:	Design and exploring the result with data visualizations					3	75	70	L	M	M	M	L	-	-	-	M	L	M	M																							
CLO-2:	Conducting exploratory data analysis using visualization techniques and tools.					3	75	70	M	H	M	M	M	-	-	-	M	L	M	M																							
CLO-3:	Visual presentations of data for effective communication.					3	80	75	M	M	H	H	M	M	-	-	M	M	H	H																							
CLO-4:	Designing and evaluating color palettes for visualization based on principles of perception.					3	85	80	M	M	M	H	H	-	-	-	M	M	H	H																							
CLO-5:	Using the knowledge of perception and cognition to evaluate visualization design alternatives					3	85	80	M	H	M	H	H	-	-	-	M	M	H	H																							
CLO-6:	Identifying opportunities for the application of data visualization in various domains.					3	85	80	M	H	H	H	H	-	-	-	M	M	H	H																							

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

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

Learning Resources	1. Big Data Visualization, James D. Miller, Copyright © 2017 Packt Publishing	3. Storytelling with data - a data visualization guide for business professionals by Cole Nussbaumer Knaflic, Wiley publications
	2. Designing Data Visualizations by Noah Iliinsky and Julie Steele, Copyright © 2011 Julie Steele and Noah Iliinsky. All rights reserved. Printed in the United States of America	

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%	-	40%	-	30%	-	-	30%	30%	-
Level 2	Apply Analyze	40%	-	40%	-	50%	-	-	50%	40%	-
Level 3	Evaluate Create	20%	-	20%	-	20%	-	-	20%	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
Valiyullasha, Bugtreat Technologies, UK, ceo@bugtreat.com	Prof. Shiv ram Dubey, IIT Sricity, srdubey@iits.in	Dr. Mangalraj, SRMIST,
Saravankarthick, Hewlett-Packard, India, saravankarthick.chinniah@dxc.com	Prof. Bhawana Rudra, NITK suratkal, bhawanarudra@nitk.edu.in	Dr. K.P. Vijayakumar, 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	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:	Understand service delivery and associated processes				L	-	L	H	L	-	-	-	H	H	M	L	-	-	-
CLR-3:	Understand storage and security management related to IT Infrastructure				M	-	-	H	H	-	-	-	L	L	L	H	-	-	-
CLR-4:	Understand performance and tuning processes and associated case studies				M	L	M	H	L	-	-	-	M	H	H	H	-	-	-
CLR-5:	Understand the suitable for combinations in information technology, business administration and electronic commerce.				M	L	L	L	-	-	-	-	H	H	M	L	-	-	-
CLR-6:	Understand the suitable for combinations in information technology, business administration and electronic commerce.	L	-	L	L	-	-	-	-	L	L	H	L	-	-	-			
CLR-7:	Understand the suitable for combinations in information technology, business administration and electronic commerce.	H	-	L	L	L	-	-	-	L	L	H	L	-	-	-			

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:	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
CLO-2:	Be able to investigate, critically analyze and evaluate the impact of new and current ICT services to an organization	2	75	80
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
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
CLO-5:	Be able to reflect critically on the role of an enterprise architect in an organization	2	75	85
CLO-6:	Be able to synthesize the theoretical, technical and management issues that deliver ICT services to an organization	2	80	85

Duration (hour)	9		9		9		9		9	
S-1	SLO-1	Introduction – IT Infrastructure Challenges in IT Infrastructure Management	Service Delivery And Support Process - Intro	Storage And Security Management - Intro	Performance And Tuning Process	Case Studies				
S-2	SLO-1	Design Factors for IT Organizations	Service Level Management	Space Management	Introduction on tuning process	Asset Network Corporation case				
S-3	SLO-1	Design Factors for IT Infrastructures	Financial Management	Hierarchical space management	Difference between Performance and Tuning processes and other Infrastructure processes	Radio Shack case				
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				
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				
S-6	SLO-1	Tools and their integration	Configuration Management	Data Retention	Performance and tuning applied to major resource environments	Enron case				
S-7	SLO-1	IT Systems and Service Management Process	Service desk, Incident management	Computer Security Identity Management	Assessing an Infrastructure's performance and tuning process	Tycocase				

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

Learning Resources	1. Rich Schiesser, "IT Systems Management", 2nd edition, 2010, Pearson Education, ISBN: 978-0137025060	4. Leonard Jessup, Joseph Valacich, "Information System Today: Managing Digital World", 3rd Edition, 2007, Prentice Hall, ISBN: 0-13-233506-9.
	2. P. Gupta, "IT Infrastructure and Its Management" 2nd Reprint, 2010, Tata McGraw Hill, ISBN: 978-0070699793	5. Hausman, Cook, "IT Architecture for Dummies", 2011, Wiley Publishing, Hoboken, NJ www.wiley.com ISBN: 978-0-470-55423-4
	3. Sjaak Laan, "IT Infrastructure Architecture: Infrastructure Building Blocks and Concepts", 2011, Lulu Press Inc, ISBN 978-1-4478-8128-5.	6. Richard J. Reese, "IT Architecture in Action", 2008, Xlibris Publishing, 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. Ananda Natarajan, Senior Associate Consultant, Infosys, Chennai., anand_adnan@yahoo.com		2. Dr. MB. Mukesh Krishnan, SRMIST



S-9	SLO-1	Application anatomy: Application framework basics: resources layout, values, asset XML representation and generated R.java file, Android manifest file. Creating a simple application.	activities life-cycle.		System Broadcast, PendingIntent, Notifications	Publishing Android Apps: Guide lines.
	SLO-2					
S-10					Telephony Manager: Sending SMS and making calls.	policies and process of uploading Apps to Google play

<b>Learning Resources</b>	1.	Dawn Griffiths, David Griffiths, "Head First: Android Development", O'Reilly 2015, ISBN: 9781449362188.	3.	Paul Deitel, Harvey Deitel, Alexander Wald, "Android 6 for Programmers, App Driven approach", 2015, Prentice Hall, ISBN: 9780134289366.
	2.	Greg Milette, Adam Stroud, "PROFESSIONAL Android™ Sensor Programming", John Wiley and Sons, Inc 2012, ISBN/978111265055, 9781280678943, 978111227459	4.	<a href="http://developer.android.com/training/index.html">http://developer.android.com/training/index.html</a> as on Date 21.4.2016

### 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)																				
CLR-1:	CLR-2:	CLR-3:	CLR-4:	CLR-5:	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	
CLO-1:	Implement the appropriate modeling method for the given problem	CLO-2:	Explain the system abstraction in different levels	CLO-3:	Apply the models under continuous system simulation	CLO-4:	Analyze the probability concepts for simulating a system	CLO-5:	Apply tools to like GPSS and SIMSCRIPT to check model properties of a system	2	80	85	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
					2	75	80	H	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
					2	85	80	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
					2	80	75	H	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
					2	75	85	H	-	-	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Duration (hour)	9	9	9	9	9
S-1	<b>SLO-1</b> <b>Introduction to system modelling</b>	Continuous System Simulation - Introduction	Probability Theory	Queueing Theory - Introduction	General description of GPSS and SIMSCRIPT
S-2	<b>SLO-1</b> <b>Modeling principles and concepts</b>	Numerical solution of differential equations	Probability CONCEPTS IN SIMULATION -	Arrival Pattern distributions	programming in GPSS
S-3	<b>SLO-1</b> <b>Continuous systems and Discrete systems</b>	Analog computers	Monte Carlo techniques	servicing times, queueing disciplines	<b>Application of GPSS on specific problem</b>
S-4	<b>SLO-1</b> Modeling, types of models, subsystems	Hybrid computers	Application of Monte Carlo techniques	measure of queues	Simulation Programming Techniques
S-5	<b>SLO-1</b> corporate model, system study..	continuous system simulation languages CSMP	Stochastic variables	mathematical solutions to queueing problems	Data Structures
S-6	<b>SLO-1</b> 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	<b>Illustration of Continuous System Simulation</b>	<b>Illustration of Probability concepts</b>	Simulation programming tasks	Simulation algorithms in GPSS and SIMSCRIPT
S-9	SLO-1 cobweb models	<b>Case Study</b>	<b>Case Study</b>	Analysis of simulation output	<b>Case Study</b>

Learning Resources	<ol style="list-style-type: none"> <li>Geoffery Gordon, "System Simulation", PHI, 2<sup>nd</sup> edition</li> <li>Jerry Banks, John S. Carson, Barry Nelson, David M. Nicol, "Discrete - Event System Simulation", PHI, 3<sup>rd</sup> edition</li> <li>Karian. Z.A., Dvdewicz. E.Z, "Modern Statistical Systems and GPSS Simulation", Freeman, 1991</li> </ol>
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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
		<b>1. Prof.S.S.Sridhar, SRMIST</b>
		<b>2. Mr. C.Arun, SRMIST</b>

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:*

CLR-1:	Be exposed to the context and operation of free and open source software (FOSS) communities and associated software projects.
CLR-2:	Be familiar with participating in a FOSS project
CLR-3:	Learn scripting language like Python or Perl, Ruby
CLR-4:	Learn some important FOSS tools and techniques

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

CLO-1:	Install and run open-source operating systems.	3	80	70
CLO-2:	Gather information about Free and Open Source Software projects from software releases and from sites on the internet.	3	85	75
CLO-3:	Build and modify one or more Free and Open Source Software packages.	3	75	70
CLO-4:	Contribute software to and interact with Free and Open Source Software development projects.	3	85	80
CLO-5:	Identify and apply various linux commands	3	85	75

Learning		
Level/Thin	ExpectedPr	ExpectedAtt
1	2	3

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

Duration (hour)	9	9	9	9	9
S-1	SLO-1 Introduction- 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 related commands	Usage of design Tools like Argo UML or equivalent	Open Source Software Development
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 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	
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,

S-7	SLO-1 SLO-1	Four degrees of freedom	X Windows System Configuration	Shell scripting for system configurations	conditional statements, classes, Exceptions packages	Open Office
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 SLO-2	Implications	Strategies for keeping a Secure Server	Shell scripting with looping		

Learning Resources	<ol style="list-style-type: none"> <li>Ellen Siever, Stephen Figgins, Robert Love, Arnold Robbins, "Linux in a Nutshell", Sixth Edition, O'Reilly Media, 2009.</li> <li>Linux Programming Bible by John Goerzen, IDG Books, New Delhi, 2000.</li> <li>Your Unix - The Ultimate Guide by Sumitabha Das, TMH, 2000</li> </ol>	<ol style="list-style-type: none"> <li>Perl Programming book at <a href="http://www.perl.org/books/beginning-perl/">http://www.perl.org/books/beginning-perl/</a>.</li> <li>Ruby programming book at <a href="http://ruby-doc.com/docs/ProgrammingRuby/">http://ruby-doc.com/docs/ProgrammingRuby/</a>.</li> <li>Samba: URL : <a href="http://www.samba.org/">http://www.samba.org/</a>.</li> </ol>
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#### 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
1. <i>Bijoymon Soman</i> Sr. Test Analyst UST Global, Philadelphia, PA, USA	1. <i>Dr. Arun kumar M N</i> Assistant Professor, Federal Institute of Science and Technology, Angamaly, Kerala	1. <i>Mrs Aswathy K Cherian, SRMIST</i>
		2. <i>Mrs. Nimala, SRMIST</i>



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	

<b>Course Learning Rationale (CLR):</b>	The purpose of learning this course is to:						<b>Program Learning Outcomes (PLO)</b>																							
<b>CLR-1:</b>	Understand the basics of Android devices and Platform.						Learning	1	2	3	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
<b>CLR-2:</b>	Acquire knowledge on basic building blocks of Android programming required for Application development																													
<b>CLR-3:</b>	Gain knowledge to user interfaces used in android applications																													
<b>CLR-4:</b>	Acquire knowledge on advanced application concepts like networking, Animations and Google Maps services etc																													
<b>CLR-5:</b>	Develop and publish Android applications in to Android Market																													
<b>CLR-6:</b>	Understand the knowledge of JSON and MQTT																													
<b>Course Learning Outcomes (CLO):</b>	At the end of this course, learners will be able to:						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									
<b>CLO-1:</b>	To exposed to technology and business trends impacting Android Platform																													
<b>CLO-2:</b>	Be competent with the characterization and architecture of mobile applications																													
<b>CLO-3:</b>	To understanding enterprise scale requirements of mobile applications																													
<b>CLO-4:</b>	To designing and developing mobile applications using one application development framework																													
<b>CLO-5:</b>	To understand how to handle and share android data																													
<b>CLO-6:</b>	To develop an android services and to publish android application for use																													

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 Architecture				
	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				

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

<b>Learning Resources</b>	1. Neil Smyth, Kotlin / Android Studio 3.0 Development Essentials - Android 8 Edition, Payload Media, Inc. 2017	3. Mark Wickham, Practical Android: 14 Complete Projects on Advanced Techniques and Approaches, Apress, 2018
	2. Bill Phillips and Brian Hardy, Android Programming: The Big Nerd Ranch Guide, Big Nerd Ranch, Inc. 2013	4. David Griffiths, Head First: Android Development, O'Reilly 2015, ISBN: 9781449362188

**Learning Assessment**

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#		Theory	Practice
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice		
Level 1	Remember	40 %	-	30 %	-	30 %	-	30 %	-	30%	-
Level 2	Understand	40 %	-	40 %	-	40 %	-	40 %	-	40%	-
	Apply	40 %	-	40 %	-	40 %	-	40 %	-	40%	-
Level 3	Analyze	20 %	-	30 %	-	30 %	-	30 %	-	30%	-
	Evaluate	20 %	-	30 %	-	30 %	-	30 %	-	30%	-
	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. Dinesh Babu T, Development Manager, HP India. dinesh.thavamani@hp.com		1. Mr. S. Pradeep, SRMIST
2. Suraj Sundaram, Associate IT Consultant, TCS Canada. surajs@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	

<b>Course Learning Rationale (CLR):</b>	The purpose of learning this course is to:														
<b>CLR-1:</b>	Understand and write programs in R														
<b>CLR-2:</b>	Gain knowledge on the working of statistical data in R														
<b>CLR-3:</b>	Gain knowledge on Linear regression and manipulation in R														
<b>CLR-4:</b>	Acquire knowledge on classification and clustering in R														
<b>CLR-5:</b>	Acquire knowledge on Linear Model selection and regularization and working it in R														
<b>CLR-6:</b>	Introduce the Tree based methods and working it in R														

<b>Course Learning Outcomes (CLO):</b>	At the end of this course, learners will be able to:																		
<b>CLO-1:</b>	Acquire the knowledge on data analysis in R		2	80	85	Engineering Knowledge	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>CLO-2:</b>	Acquire the ability to find meaning pattern using R		2	75	80	Problem Analysis	H	-	-	-	-	-	-	-	-	-	-	-	-
<b>CLO-3:</b>	Acquire the ability to find graphically interpret data in R		2	75	80	Design & Development	H	H	-	-	-	-	-	-	-	-	-	-	-
<b>CLO-4:</b>	Apply the knowledge for implementing analytical algorithms		2	80	75	Analysis, Design, Research	H	-	-	-	-	-	-	-	-	-	-	-	-
<b>CLO-5:</b>	Handle large scale analytics projects from various domains		2	75	85	Modern Tool Usage	H	-	-	-	-	-	-	-	-	-	-	-	-
<b>CLO-6:</b>	Develop intelligent decision support systems		2	75	80	Society & Culture Environment & Sustainability Ethics	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	Partial 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

<b>Learning Resources</b>	1. G James, D. Witten, T Hastie, and R. Tibshirani, <i>An Introduction to Statistical Learning: with Applications in R</i> , Springer, 2013
	2. Chambers, John, <i>Software for Data Analysis Programming with R</i> , Springer, 2008
	3. Trevor Hastie Robert Tibshirani Jerome Friedman, <i>The Elements of Statistical Learning, Data Mining, Inference, and Prediction (2nd Edn.)</i> , Springer, 2014
	4. Mark Gardener, <i>Beginning R: The Statistical Programming Language</i> , Wiley, 2013
	5. Upadhyaya and A. Upadhyaya, <i>Material Science and Engineering</i> , 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, prakait@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		

<b>Course Learning Rationale (CLR):</b>	The purpose of learning this course is to:			<b>Learning</b>			<b>Program Learning Outcomes (PLO)</b>																			
<b>CLR-1:</b>	Understand the basics of ios device and platform			1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15					
<b>CLR-2:</b>	Understand the basic building blocks of ios programming required for App development			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					
<b>CLR-3:</b>	Understand Data storage mechanism in ios						H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>CLR-4:</b>	Understand advanced application concepts like animations, webservices, etc						H	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>CLR-5:</b>	Develop and publish ios application in to ios market						H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>CLR-6:</b>	understanding enterprise scale requirements of mobile application						H	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Course Learning Outcomes (CLO):</b>	At the end of this course, learners will be able to:						2	80	85	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>CLO-1:</b>	Acquire the knowledge of ios device and platform			2	75	80	H	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
<b>CLO-2:</b>	Acquire the knowledge on ios programming for App Development			2	85	80	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
<b>CLO-3:</b>	Apply the concepts used for data storage in ios			2	80	75	H	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
<b>CLO-4:</b>	Apply the animation and webservice concepts in the App			2	75	85	H	-	-	H	-	-	-	-	-	-	-	-	-	-	-	-	-			
<b>CLO-5:</b>	Understand the basic idea to publish ios application into ios market			2	80	85	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
<b>CLO-6:</b>	Understand the needs of enterprise to develop App			2	80	85	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			

Duration (hour)	9		9		9		9		9	
S-1	SLO-1	Top Mobile OS in Market	The Swift Language-Types	Programmatic views-anchors, Margins	Stack Views	Webservices				
	SLO-2	Difference between IOS and Android	Literals and subscripting, Initializers, Properties, Instance methods	Programmatic controls	Nested stack views					
S-2	SLO-1	IOS Architecture	Optionals, Subscripting dictionaries, Loops and String Interpolation	Localization	Segues	JSON Data				
	SLO-2		Enumerations							
S-3	SLO-1	History of IOS	Views-Basics	Internalization	UINavigationController	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									

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

**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%	-
	<b>Total</b>	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. <i>Mr.K.Mahendran, Founder, Dreams Technologies, Chennai.</i>	1.	1. <i>Dr.D.Rajeswari, SRMIST</i>
2.	2.	2. <i>Mr.K.Navin, SRMIST</i>

Course Code	18CSP101L	Course Name	<b>Industrial Training I</b> (To be undergone in the prescribed semester only as per the curriculum)	Course Category	P	<b>Project Work, Seminar, Internship In Industry / Higher Technical Institutions (P)</b>			
						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		

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

<b>Course Learning Outcomes (CLO):</b>	At the end of this course, learners will be able to:
<b>CLO-1 :</b>	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 75%	Presentation * 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	<b>Seminar</b> (To be undergone in the prescribed semester only as per the curriculum)	Course Category	P	<b>Project Work, Seminar, Internship In Industry / Higher Technical Institutions (P)</b>			
						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		

<b>Course Learning Rationale (CLR):</b>	The purpose of learning this course is to:
<b>CLR-1 :</b>	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.

<b>Course Learning Outcomes (CLO):</b>	At the end of this course, learners will be able to:
<b>CLO-1 :</b>	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 60%	Presentation skills / ability to answer questions / understanding of the topic* 40%

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

Course Code	18CSP103L	Course Name	Project Phase-I / Internship (To be undergone in the prescribed semester only as per the curriculum)	Course Category	P	Project Work, Seminar, Internship In Industry / Higher Technical Institutions (P)	L	T	P	C
							0	0	6	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	CSE	Data Book / Codes/Standards	As exposed to during the duration of internship		

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

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

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

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

Course Code	18CSP104L	Course Name	Project (Phase-II) / Semester Internship (To be undergone in the prescribed semester only as per the curriculum)	Course Category	P	Project Work, Seminar, Internship In Industry / Higher Technical Institutions (P)	L	T	P	C
							0	0	20	10

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	CSE	Data Book / Codes/Standards	As required for the project work		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1:	To prepare the student to gain major design and or research experience as applicable to the profession
CLR-2:	Apply knowledge and skills acquired through earlier course work in the chosen project
CLR-3:	Make conversant with the codes, standards, application software and equipment
CLR-4:	Carry out the projects within multiple design constraints
CLR-5:	Incorporate multidisciplinary components
CLR-6:	Acquire the skills of comprehensive report writing

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:
CLO-1:	Design a system / process or gain research insight into a defined problem as would be encountered in engineering practice taking into consideration its impact on 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)
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CLR-1:	Utilize success habits to improve achievement in life	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15			
CLR-2:	Develop inter personal skills and be an effective goal oriented team player to achieve success	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge																	
CLR-3:	Utilize professionalism with idealistic, practical and moral values that govern the behavior				Problem Analysis																	
CLR-4:	Become an expert in communication and problem solving skills				Design & Development																	
CLR-5:	Re-engineer attitude required to succeed and understand its influence on behavior to achieve professionalism				Analysis, Design, Research																	
CLR-6:	Enhance holistic development of students and improve their employability skills				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:	2	80	75	-	-	-	-	-	-	H	H	H	H	-	H	-	-	-
CLO-1:	Identify success habits	2	75	70	-	-	-	-	-	-	H	H	H	H	-	H	-	-	-
CLO-2:	Acquire inter personal skills and be an effective goal oriented team player	2	80	75	-	-	-	-	-	-	H	H	H	H	-	H	-	-	-
CLO-3:	Develop professionalism with idealistic, practical and moral values	2	75	70	-	-	-	-	-	-	H	H	H	H	-	H	-	-	-
CLO-4:	Acquire communication and problem solving skills.	2	85	80	-	-	-	-	-	-	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
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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. Mr Ajay Zenner, Career Launcher, ajay.z@careerlauncher.com		2. Dr.Dinesh Khattar, Delhi University, dinesh.khattar31@gmail.com		2. Mrs. B. Revathi, SRMIST	
				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)
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CLR-1:	Utilize the citizen's rights	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15																		
CLR-2:	Utilize the basic citizen's fundamental rights of freedom of speech, expression, equality, religion and privacy	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-3:	Identify the Indian constitutional framework with union parliament, government and their functions and citizen's rights																			2	80	75	-	-	-	-	-	M	H	H	H	-	H	-	-	-	
CLR-4:	Utilize the States functionality and provisions for the betterment of the individual and society																			2	75	70	-	-	-	-	-	M	H	H	H	H	M	H	-	-	-
CLR-5:	Identify the emergency provisions, the functions of election and public service commissions, identify the tax system																			2	80	75	-	-	-	-	-	M	H	H	H	M	H	-	-	-	-
CLR-6:	Utilize the rights of a citizen both individual and as a society by understanding the constitutional provision and rights																			2	85	80	-	-	-	-	-	M	H	H	H	M	H	-	-	-	-
CLR-6:	Utilize the rights of a citizen both individual and as a society by understanding the constitutional provision and rights																			2	85	80	-	-	-	-	-	M	H	H	H	M	H	-	-	-	-

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 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	M	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 SLO-2 Historical perspective of the Constitution of India	The Directive Principles of State Policy Scheme of the Fundamental Right to Equality	President of India (with Powers and Functions) Prime Minister of India (with Powers and Functions)	Governor of the State (with Powers and Functions) The Chief Minister of the State (with Powers and Functions)	Local Self Government – Constitutional Scheme in India Emergency Provisions : National, President Rule, Financial Emergency
S-2	SLO-1 Salient features and characteristics of the Constitution of India SLO-2 Citizenship	Scheme of the Fundamental Right to certain Freedom under Article 19 Scope of the Right to Life and Personal Liberty under Article 21	Union Judiciary (Supreme Court) Jurisdiction of the Supreme Court State Government	State Judiciary (High Courts) Union Territories, Panchayats,	Election Commission of India (with Powers and Functions) The Union Public Service Commission (with Powers and Functions)
S-3	SLO-1 Scheme of the fundamental rights SLO-2 The scheme of the Fundamental Duties and its legal status	Union Government, Union Legislature (Parliament) Lok Sabha and Rajya Sabha (with Powers and Functions), Union Executive	State Legislature, Legislative Assembly, Legislative Council Powers and Functions of the State Legislature, State Executive	Municipalities, Scheduled and Tribal Areas Co-operative Societies	Amendment of the Constitutional Powers and Procedure 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
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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. 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)
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CLR-1:	Utilize rich Indian heritage and knowledge for self-healing and self-protection from diseases	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15			
CLR-2:	Apply meditation for attaining happiness and balancing emotions and state of mind and body	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-3:	Intellectually develop oneself by identifying oneness with divine state and transform towards absolute oneness in space				-	M	-	-	-	-	H	H	H	H	H	H	-	H	-	-	-	-
CLR-4:	Socially transform into a meaningful and purposeful individual to both self and society				-	M	-	-	-	-	H	H	H	H	H	H	-	H	-	-	-	-
CLR-5:	Spiritually enlighten oneself by purifying the body, soul and have a blissful existence				-	M	-	-	-	-	H	H	H	H	H	H	-	H	-	-	-	-
CLR-6:	Achieve personal benefits of whole health and wellbeing by practicing yoga for physical, emotional and mental fitness				-	M	-	-	-	-	H	H	H	H	H	H	-	H	-	-	-	-
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:				2	80	75	-	M	-	-	-	H	H	H	H	-	H	-	-	-	-
CLO-1:	Identify Indian heritage, culture. Identify key anatomical structures in the human body and basic exercises for the same	2	75	70	-	M	-	-	-	H	H	H	H	-	H	-	-	-	-			
CLO-2:	Apply yoga meditation practices for emotional development and wellbeing	2	80	75	-	M	-	-	-	H	H	H	H	-	H	-	-	-	-			
CLO-3:	Identify educational and intellectual development methods using five sense realization and transformation	3	75	70	-	M	-	-	-	H	H	H	H	-	H	-	-	-	-			
CLO-4:	Demonstrate human values and emotions through thorough understanding about life, naturopathy and food habits	3	85	80	-	M	-	-	-	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	-	-	-	-			
CLO-6:	Demonstrate yoga exercises and postures to stretch and strengthen the body and mind	3	85	80	-	M	-	-	-	H	H	H	H	-	H	-	-	-	-			

Duration (hour)	Physical Development	Emotional Development	Intellectual Development	Social Development	Spiritual Development
6	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 (Kayakalpa Yoga)	Practice10: Kayakalpa, 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 (Agha) 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: Kayakalpa Yoga, Pranayama	Practice11: Kayakalpa Yoga, Krisya Yoga	Practice14: Project Submission
	SLO-2 Meditation (Self Realization) – Relaxation	Meditation (Agha) & Relaxation	Meditation (Agha) - Relaxation	Yoga Mudhras, Meditation (Santhi) & Relaxation	Meditation, Introspection, Sublimation
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: Kayakalpa, 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. <i>Sadhguru Jaggi Vasudev, Inner Engineering – A yogi's guide to joy, 2016</i>	6. <i>Vivekananda Kenthria Prkasan Trust, Yogam, 2006</i>
	2. <i>Shri Shri Ravi Shankar, The Art of stress-free Living, 2011</i>	7. <i>Swami Chetanananda, Meditation and Its Methods According to Swami Vivekananda, Jan 2001</i>
	3. <i>Swami Ramdev Ji Yog Its Philosophy and Practice, 2008</i>	8. <i>Dr.Lakshminarain Sharma, Yoga for the cure of Common Diseases, Mar 2016</i>
	4. <i>Yogiraj Vethathiri Maharishi, Yoga for Modern Age, Tenth edition, Vethathiri Publications, 2007</i>	9. <i>Swami Satyananda Saraswati, Asana Pranayama Mudra Bandha, Bihar School of Yoga, 1993</i>
	5. <i>Yogiraj Vethathiri Maharishi, Simplified Physical Exercises, Forty Second edition, Jan-2014</i>	10. <i>Dr. Asana Andiappan, Thirumoolar's Astanga Yoga, International Yoga Academy, 2017</i>

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	-	40%	-	30%	-	30%	-	30%	-	-
Level 2	Apply	-	40%	-	40%	-	40%	-	40%	-	-
	Analyze	-	40%	-	40%	-	40%	-	40%	-	-
Level 3	Evaluate	-	20%	-	30%	-	30%	-	30%	-	-
	Create	-	20%	-	30%	-	30%	-	30%	-	-
	Total	100 %		100 %		100 %		100 %		-	

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

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

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

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning	Program Learning Outcomes (PLO)
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CLR-1:	Connect the learners to their potential, identify their potential to create a new positive world	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
CLR-2:	Analyze the merits and demerits of different educational systems. Identify the different systems of education	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-3:	Draw attention towards the weaknesses they are susceptible to and inspire them through positive models				L	M	-	-	M	H	-	H	H	H	H	-	H	-	-	-	-
CLR-4:	Instill a sense of professional ethics which help them develop a safe comfortable and prosperous society				M	H	M	-	H	H	M	M	H	H	H	-	H	-	-	-	-
CLR-5:	Cultivate a spirit of willing accommodation in an increasingly diverse world				M	-	-	-	M	H	M	M	H	H	H	-	H	-	-	-	-
CLR-6:	Strengthen, enhance the spirit of positivity and facilitate positive contribution in various spheres of life				H	M	-	-	H	H	H	H	H	H	H	-	H	-	-	-	-
					M	M	-	-	H	H	H	H	H	H	H	-	H	-	-	-	-

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	2	80	75
CLO-1:	Equipped with an awareness of their positive energy and power	2	75	70
CLO-2:	Identify the meaning of 'education'; have a clearer and better understanding in taking education to the masses	2	80	75
CLO-3:	Assess their weaknesses; understand risks involved and rectify them through learning from positive and negative instances	2	75	70
CLO-4:	Realize their professional responsibilities	2	85	80
CLO-5:	Acquire the required values in an expanding pluralistic world not be swept off their feet due to the rapid changes	2	80	75
CLO-6:	Equip with better understanding of themselves, society they live. Identify responsibilities in creating a peaceful world	2	80	75

Duration (hour)	Visions for Youth	Youth and Education	Youth and Society	Youth as Professionals	Youth in Pluralistic Society
	6	6	6	6	6
S-1	SLO-1	Introduction	Meaning and the significance of education	Need for social values in the present context	Introduction to pluralistic society, forces of globalization
	SLO-2	Quiz	Brainstorming	Poem – "Where the mind is without fear" Write up on various instances from real life	Introduction to professional values 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

<b>Learning Resources</b>	1. Kalam, APJ Abdul. <i>Wings of Fire: AN Autobiography of APJ Abdul Kalam</i> . Ed. Sangam Books Ltd., 1999	4. Thomas A Address to VTU Students by Narayana Murthy. <a href="https://www.karnataka.com/personalities/narayana-murthy/vtu-address-2006/">https://www.karnataka.com/personalities/narayana-murthy/vtu-address-2006/</a> 5. World Economic forum. "India's top 7 challenged from skills to water scarcity"
	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. <a href="http://www.mkgandhi.org">www.mkgandhi.org</a>	
	3. Piroda, Sam. "Challenges in Science and Technology". <a href="http://www.nfdindia.org/loc19.htm">www.nfdindia.org/loc19.htm</a>	

<b>Learning Assessment</b>											
	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 %	

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<b>Course Designers</b>				
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