Course Code	21EEO304T	Course Name	ENERGY EFFICIENT PRACTICES	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	Electrical and Electronics Engineering	Data Book / Codes / Standards			Nil

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Program Outcomes (PO)												Program Specific outcomes		
CLR-1:	Interpret present energy scenario and purpose of energy efficiency in engineering and its application	1	2	3	4	5	6	7	8	9	10	11	12			
CLR-2:	Comprehend the concept of energy efficiency in electrical supply system and machines	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern Tool Usage	The engineer and society	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO-1	PSO-2	PSO-3
CLR-3:	Describe energy efficiency practices in various basic electric utilities															
CLR-4:	Inspect problems on lighting and DG systems to provide efficient solutions															
CLR-5:	Analyze energy scenario and efficient solutions in industrial sector															

Course Outcomes (CO):	At the end of this course, learners will be able to:															
CO-1:	Apprehend energy scenario and efficiency opportunities	3	-	-	-	-	-	-	2	-	-	-	-	-	-	-
CO-2:	Analyze efficiency of electrical supply system and energy saving methodologies	3	-	-	-	-	-	-	2	-	-	-	-	-	-	-
CO-3:	Perform energy efficiency practices in electric utility systems through new technologies	3	-	-	-	-	-	-	2	-	-	-	-	-	-	-
CO-4:	Design the efficient lighting and DG system	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO-5:	Examine industrial system to determine energy efficient potential	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Unit-1 - Energy Scenario	9 Hour

Introduction: Commercial and Non-commercial energy, primary and secondary energy resources, energy needs of growing economy, energy pricing, Energy Conservation Act-2001, Bureau of Energy Efficiency.

Unit-2 - Electrical Supply System	9 Hour

Electrical supply system, components of AC power, Concept of sanctioned load, maximum demand, contract demand, and AC machines.

Unit-3 - Energy Efficient Practices	9 Hour

Energy efficiency in electrical utilities, tips for energy saving, compressed air system, Energy saving opportunities in HVAC and refrigeration system, impact of Power Electronics in energy efficiency

Unit-4 - Lighting and Distributed Generation Systems	9 Hour

Introduction, Basic definitions, Types of different lamps, design and their features, energy efficiency opportunities in lighting and distributed generation systems

Unit-5 - Industrial Sector	9 Hour

Energy efficiency in industrial sector, main challenges to improve energy efficiency in industry, Energy Efficient Technologies, Industrial Automation, Industrial Sensors

Learning Resources	1. Bose, B. K., "Global energy scenario and impact of power electronics in 21st century", IEEE Transactions on Industrial Electronics, 60(7), 2638-2651, 2012. 2. Hegger, M., Fuchs, M., Stark, T., & Zeumer, M., "Energy manual: sustainable architecture", Walter de Gruyter, 2012.	3. El-Hawary, M. E., "Electrical energy systems", CRC Press, second edition, 2018. 4. Malinauskaite, J., Jouhara, H., Ahmad, L., Milani, M., Montorsi, L., & Venturelli, M., "Energy efficiency in industry: EU and national policies in Italy and the UK. Energy", 172, 255-269, 2019. 5. Dobrotkova, Z., Lukas, A., Singh, J., "Energy Efficiency in Industry", World Bank Group, 2018.

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (CLA)				Summative Final Examination (40% weightage)	
		Formative CLA-1 Average of unit test (50%)		Life-Long Learning CLA-2 (10%)			
		Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	-	20%	-	20%	-
Level 2	Understand	20%	-	20%	-	20%	-
Level 3	Apply	30%	-	30%	-	30%	-
Level 4	Analyze	30%	-	30%	-	30%	-
Level 5	Evaluate	-	-	-	-	-	-
Level 6	Create	-	-	-	-	-	-
Total		100 %		100 %		100 %	

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. Kusuma Eshwar, Danfoss industries Pvt ltd, Chennai	1. Dr. K V Praveen Kumar, SVNIT Surat	1. Dr. Ravi Eswar K M, SRMIST
2. Dr. Patnana Hema Kumar, Hella India Automotive Private limited, Pune, Maharashtra	2. Dr. Hari Priya Vemuganti, NIT Raipur	2. Dr. V. Pradeep, SRMIST

Course Code	21CSS303T	Course Name	DATA SCIENCE		Course Category	S	ENGINEERING SCIENCES	L	T	P	C
								2	0	0	2

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Program Outcomes (PO)												Program Specific outcomes		
		1	2	3	4	5	6	7	8	9	10	11	12			
CLR-1 :	Understand the basics of data	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern Tool Usage	The engineer and society	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO-1	PSO-2	PSO-3
CLR-2 :	Learn the Pandas library to analyze data frames															
CLR-3 :	Utilize different methods of data acquisition and data cleaning															
CLR-4 :	Explore the visualization tools for different kinds of input data formats															
CLR-5 :	Apply supervised and unsupervised learning to learn the hidden patterns from the data and predict the output															

Course Outcomes (CO):	At the end of this course, learners will be able to:															
CO-1:	Understand the relationship between data	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
CO-2:	Identify the different data structures to represent data	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
CO-3:	Identify data manipulation and cleaning techniques using pandas	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
CO-4:	Constructs the Graphs and plots to represent the data using python packages	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
CO-5:	Apply the principles of the data science techniques to predict and forecast the outcome of real-world problem.	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-

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Unit-1 - Introduction to Data Science, Numpy & Pandas — 10 Hour

Introduction to Data science: Facets of data, Data Science Process Introduction to Numpy: Numpy, creating array, attributes, Numpy Arrays objects: Creating Arrays, basic operations (Array Join, split, search, sort), Indexing, Slicing and iterating, copying arrays, Arrays shape manipulation, Identity array, eye function Pandas: Exploring Data using Series, Exploring Data using DataFrames, Index objects, Re index, Drop Entry, Selecting Entries, Data Alignment, Rank and Sort, Summary Statistics, Index Hierarchy Data Acquisition: Gather information from different sources, Web APIs, Open Data Sources, Web Scrapping.

Unit-2- Data Wrangling, Data Cleaning and Preparation — 10 Hour

Data Handling: Problem faced when handling large data-General techniques for handling large volume of data- General programming tips for dealing large data sets Data Wrangling: Clean, Transform, Merge, Reshape: Combining and Merging Datasets, Merging on Index, Concatenate, Combining with overlap, Reshaping, Pivoting Data Cleaning and Preparation: Handling Missing Data, Data Transformation, String Manipulation, summarizing, Binning, classing and Standardization, outlier/Noise& Anomalies.

Unit-3- Visualization — 10 Hour

Customizing Plots: Introduction to Matplotlib, Plots, making subplots, controlling axes, Ticks, Labels & legends, annotations and Drawing on subplots, saving plots to files, matplotlib configuration using different plot styles, Seaborn library. Making sense of data through advanced visualization : Controlling line properties of chart, creating multiple plots, Scatter plot, Line plot, bar plot, Histogram, Box plot, Pair plot, playing with text, styling your plot, 3d plot of surface

Learning Resources	1. Grus, J. (2019). Data Science from Scratch, 2nd Edition. O'Reilly Media, Inc. 2. Jiawei Han, Micheline Kamber and Jian Pei (2012), Data Mining Concepts and Techniques, Third Edition, Elsevier. 3. Davy Cielen, Arno D. B. Meysman, and Mohamed Ali (2016), Introducing Data Science: Big data, machine learning, and more, using Python tools, Manning Publications. 4. McKinney, W. (2018). Python for data analysis: Data wrangling with pandas, NumPy, and IPython. O'Reilly Media, Inc.	5. Vanderplas, J. T. (2017). Python data science handbook: Essential tools for working with data. O'Reilly Media, Inc. 6. Jeffrey S. Saltz and Jeffrey M. Stanton (2018), An Introduction to Data Science, Sage Publication. 7. Shai Vaingast (2014), "Beginning Python Visualization Crafting Visual Transformation Scripts", Second Edition, Apress. 8. Wes Mc Kinney (2012). "Python for Data Analysis", O'Reilly Media.

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (CLA)				Summative Final Examination (40% weightage)	
		Formative CLA-1 Average of unit test (50%)		Life-Long Learning CLA-2 (10%)			
		Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	40%	-	20%	-	40%	-
Level 2	Understand	40%	-	20%	-	40%	-
Level 3	Apply	10%	-	20%	-	10%	-
Level 4	Analyze	10%	-	20%	-	10%	-
Level 5	Evaluate	-	-	10%	-	-	-
Level 6	Create	-	-	10%	-	-	-
	Total	100 %		100 %		100 %	

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. Veeramanickam. M.R.M, Associate Professor Chitkara University Institute of Engineering and Technology	1. Mr. Snehith Allam Raju Senior Manager Advanced Analytics & Architecture Envista Holdings Corporation, Hyderabad.	1. Dr.V.Kalpana, SRMIST
		2. Dr.G.Vadivu, SRMIST

Course Code	21LEM302T	Course Name	INDIAN TRADITIONAL KNOWLEDGE	Course Category	M	NON CREDIT	L	T	P	C
							1	0	0	0

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Program Outcomes (PO)													Program Specific outcomes		
CLR-1:	Introduce the learners to the early and traditional environmental friendly agricultural practices	1	2	3	4	5	6	7	8	9	10	11	12				
CLR-2:	Enable the students to recognize and appreciate the contribution of India to astronomical studies	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern Tool Usage	The engineer and society	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO-1	PSO-2	PSO-3
CLR-3:	Draw the learner's attention towards the holistic approach behind Indian system of medicine															
CLR-4:	Cultivate a sense of appreciation about ancient Indian Engineering and Technology as diverse, culture and resource specific															
CLR-5:	Develop an understanding about the connection of daily life to the environment and a healthy lifestyle through a comparison of the linguistic phrases and sayings and analyzing them from today's science															

Course Outcomes (CO):	At the end of this course, learners will be able to:															
CO-1:	Describe the ancient India's eco consciousness and India's contribution to astronomy and the beliefs associated with it	-	-	-	-	-	3	-	-	-	-	-	3	-	-	-
CO-2:	Classify the Indian aesthetic sensibility which is evidenced in the architectural monuments, economic life and religious worship	-	-	-	-	-	3	-	-	-	-	-	3	-	-	-
CO-3:	Understand how Indians have had a holistic approach towards human life integrating the body, mind and soul	-	-	-	-	-	3	-	-	-	-	-	3	-	-	-
CO-4:	Understand the importance of Traditional knowledge in Agriculture and Medicine.	-	-	-	-	-	3	-	-	-	-	-	3	-	-	-
CO-5:	relate the traditional knowledge in different sectors	-	-	-	-	-	3	-	-	-	-	-	3	-	-	-

Unit-1 - Agriculture	3 Hour

Early agricultural settlements - Influencing Factors – locale and climate-Locating the early agricultural settlements in the Indian map and indicating the timeline -Crop cultivation - Community based Environment friendly practices -Group presentations on the traditional agricultural practices in selected states-Ancient Indian Water management and irrigation methods -A region-based study of natural water resources and aquifers and types of irrigation

Unit-2 - Mathematics & Astronomy	3 Hour

Concepts of time and space - Knowledge of the Universe-Quiz based on the Indian concept of time and distance between the planets-Great astronomers and mathematicians of ancient India-The respective contributions of Astronomers and Mathematicians -The planetary system and Indian Astrology: Basic Facts-Discussion on a few sample birth charts and predictions made

Unit-3 - Medicine	3 Hour

Introduction to the school of Ayurveda, Siddha and Naturopathy: -Compare and Contrast of the methodologies, popular beliefs, myths and truths about medications-Common features - Holistic Therapeutic Approach – Natural elements, individual constitution (Humours), and the balance recommended -Understanding the rationale behind selected sample treatments provided or advised, Case Studies- Yoga and its Universal Appeal -Discussions on worldwide popularity of Yoga and meditation

| *Unit-4 - Engineering & Technology* | | | | | | | | *3 Hour* |

Architecture – Temples, forts, palaces, houses and town planning-Group Discussions through examples from different historical periods and geographical locations Metallurgy – Coins, Traditional Indian Metal Carvings, Discussions on historical periods and their architectural influences- Textile technology – Region / Culture specific Fiber, Fabric and weaving Comparing the Temple Architecture of North and Southern Indian States

| *Unit-5 - Customs, Sayings and Life Truths* | | | | | | | | *3 Hour* |

Regional myths, beliefs, and cultural practices, Noting the idioms, proverbs in mother tongues connected to seasons and festivals, Traditional Foods of India in accordance with the climate and availability of the resources, collecting old sayings in specific regions of India, Translating Regional sayings into English, Traditional sayings about Hygiene and practices pertaining to them

Learning Resources	1. *V. Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, Bharatiya Vidya Bhavan, Mumbai. 5th Edition, 2014.* 2. *Basham, A.L. Ed. A Cultural History of India. OUP, 1997.*

Learning Assessment

		Continuous Learning Assessment (CLA)						Final Examination (0% weightage)	
	Bloom's Level of Thinking	Formative CLA-1 (30%)		Formative CLA-2 (30%)		Summative (40%)			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%	-	30%	-	30%		-	-
Level 2	Understand	20%	-	20%	-	20%		-	-
Level 3	Apply	30%	-	30%	-	30%		-	-
Level 4	Analyze	20%	-	20%	-	20%		-	-
Level 5	Evaluate	-	-	-	-	-		-	-
Level 6	Create	-	-	-	-	-		-	-
	Total	100 %		100 %		100%		-	

Course Designers		
Experts from Industry	**Experts from Higher Technical Institutions**	**Internal Experts**
1. *Dr. Usha Kodandaraman, ABK AOTS , Chennai, drushsk@gmail.com*	1. *Dr. S. P.Dhanavel, Professor of English, IIT, Chennai, dhanavelsp@iitmac.in*	1. *Dr .K.Anbazhagan, SRMIST*
2. *Mr. Durga Prasad Bokka, TCS Chennai durgaprasad@tcs.com*	2. *Ms. Subashree, Asst. Prof., VIT, Chennai subashree@vit.ac.in*	2. *Dr.S.Ramya, SRMIST*

Course Code	21CSC303J	Course Name	SOFTWARE ENGINEERING AND PROJECT MANAGEMENT	Course Category	C	PROFESSIONAL CORE	L	T	P	C
							2	0	2	3

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Program Outcomes (PO)												Program Specific outcomes		
		1	2	3	4	5	6	7	8	9	10	11	12			
CLR-1:	Familiarize the software life cycle models and software development process															
CLR-2:	Illustrate the various techniques for requirements, planning and managing a technology project	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern Tool Usage	The engineer and society	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO-1	PSO-2	PSO-3
CLR-3:	Examine basic methodologies for software design, development, testing, and implementation															
CLR-4:	Understand manage user's expectations and the software development team															
CLR-5:	Apply the project management and analysis principles to software project development															

Course Outcomes (CO):	At the end of this course, learners will be able to:															
CO-1:	Identify the process of project life cycle model and process	-	-	-	-	-	-	-	-	2	-	2	-	3	-	-
CO-2:	Analyze and translate end-user requirements into system and software requirements	-	3	-	-	-	-	-	-	2	-	2	-	3	-	-
CO-3:	Identify and apply appropriate software architectures and patterns to carry out high level design of a system	-	-	2	-	-	-	-	-	2	-	2	-	3	-	-
CO-4:	Develop Test plans and incorporate suitable testing strategies	-	-	-	-	-	-	-	-	2	-	2	-	3	-	-
CO-5:	Examine the risk strategies and maintenance measures	-	-	-	-	-	-	-	-	2	-	3	-	3	-	-

Unit-1 - Introduction to Software Engineering	12 Hour

The evolving role of software, changing nature of software, Generic view of process: Software engineering- a layered technology, a process framework, Software Project Management - life cycle activities, Process models: The waterfall model, incremental process models, evolutionary process models, the unified process, Conventional- Agile, XP, Scrum, Project Initiation management – Project Charter, Project Scope, Project Objectives, Practical considerations.

Unit-2 - Software Requirements	12 Hour

Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document. Requirements engineering process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management, Software project effort and cost estimation – Cocomo model I, Cocomo Model II, LOC, Function point metrics

Unit-3 - Software Design	12 Hour

Software Design Fundamentals, Design process – Design Concepts-Design Model– Design Heuristic , Design techniques– Architectural Design - Architectural styles, Creating an architectural design- software architecture, data design, architectural styles and patterns, architectural design, conceptual model of UML, basic structural modeling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams, Design of User Interface design Elements of good design, Design issues Features of modern GUI - Menus, Scroll bars, windows, Buttons, icons, panels, error Messages etc.

Unit-4 - Software Construction	12 Hour

Coding Standards, Coding Frameworks. Reviews: Deskchecks, Walkthroughs, Code Reviews, Inspections, Coding Methods, Testing Strategies: A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, Unit Testing – Integration Testing – Validation Testing – System Testing and Debugging

Unit-5 – Product Management	12 Hour

Product Release Management, Risk management: Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM, RMMM plan, Maintenance and Reengineering

Lab Experiments
Lab 1: Identify the Software Project, Create Business Case, Arrive at a Problem Statement
Lab 2: Analyse Stakeholder and User Description and Identify the appropriate Process Model
Lab 3: Identify the Requirements, System Requirements, Functional Requirements, Non-Functional Requirements and develop a SRS Document
Lab 4: Prepare Project Plan based on scope, Find Job roles and responsibilities, Calculate Project effort based on resources
Lab 5: Prepare the Work, Breakdown Structure based on timelines, Risk Identification and Plan
Lab 6: Design a System Architecture, Use Case Diagram, ER Diagram (Database)
Lab 7: DFD Diagram (process) (Upto Level 1), Class Diagram (Applied For OOPS based Project),
Lab 8: Interaction Diagrams, State chart and Activity Diagrams
Lab 9: State and Sequence Diagram, Deployment Diagram,
Lab 10: Sample Frontend Design (UI/UX)
Lab 11: Sample code implementation
Lab 12: Master Test Plan, Test Case Design (Phase 1
Lab 13: Manual Testing
Lab 14: User Manual, Analysis of Costing, Effort and Resource
Lab 15: Project Demo and Report Submission with the team

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

Learning Assessment

		Continuous Learning Assessment (CLA)				Summative Final Examination (40% weightage)	
	Bloom's Level of Thinking	Formative CLA-1 Average of unit test (45%)		Life-Long Learning CLA-2 (15%)			
		Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	-	-	20%	20%	-
Level 2	Understand	20%	-	-	20%	20%	-
Level 3	Apply	40%	-	-	40%	40%	-
Level 4	Analyze	20%	-	-	20%	20%	-
Level 5	Evaluate	-	-	-	-	-	-
Level 6	Create	-	-	-	-	-	-
	Total	100 %		100 %		100 %	

Course Designers		
Experts from Industry	**Experts from Higher Technical Institutions**	**Internal Experts**
1. Mr. DHINAKAR JACOB SELWYN, CAP GEMINI TECHNNOLOGY		1. Mrs. Anupama C G
2. Mr. Girish Raghavan, Wipro Technologies		

Course Code	21CSC304J	Course Name	COMPILER DESIGN		Course Category	C	PROFESSIONAL CORE		L	T	P	C
									2	0	2	3

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Program Outcomes (PO)												Program Specific outcomes		
CLR-1:	Outline the implementation of Lexical Analyzer	1	2	3	4	5	6	7	8	9	10	11	12			
CLR-2:	To learn the various parsing techniques	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern Tool Usage	The engineer and society	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO-1	PSO-2	PSO-3
CLR-3:	Familiarize the intermediate code generation and run-time environment															
CLR-4:	To learn the implementation of code generator															
CLR-5:	Identify the various methods for Code Optimizer															

Course Outcomes (CO):	At the end of this course, learners will be able to:															
CO-1:	Acquire knowledge of Lexical Analyzer from a specification of a language's lexical rules	3	2	-	-	2	-	-	-	-	-	-	-	-	1	-
CO-2:	Apply different parsing algorithms to develop the parsers for a given grammar	3	3	-	-	2	-	-	-	-	-	-	-	-	1	-
CO-3:	Gain knowledge to translate a system into various intermediate codes	3	2	-	-	2	-	-	-	-	-	-	-	-	1	-
CO-4:	Analyze the methods of implementing a Code Generator for compilers	3	2	-	3	-	-	-	-	-	-	-	-	-	1	-
CO-5:	Design the methods of developing a Code Optimizer	3	-	2	3	-	-	-	-	-	-	-	-	-	1	-

Unit-1 - Introduction   12 Hour

Compilers-Phases of Compiler-Cousins of the Compiler-Grouping of Phases-Compiler construction tools- Lexical Analysis-Role of Lexical Analyzer-Input Buffering -Specification of Tokens -LEX -Finite Automata-Regular Expressions to Automata -Minimizing DFA.

Unit-2 – Top Down Parsing   12 Hour

Role of Parser-Grammars-Error Handling-Context-Free Grammars-Writing a grammar- Elimination of Ambiguity-Left Recursion- Left Factoring-Top Down Parsing — Recursive Descent Parser- Predictive Parser-LL(1) Parser- Computation of FIRST-Computation of FOLLOW-Construction of a predictive parsing table-Predictive Parsers LL(1) Grammars- Predictive Parsing Algorithm- Problems related to Predictive Parser - Error Recovery in Predictive Parsing-.

Unit-3 – Bottom-Up Parsing   12 Hour

Bottom Up Parsing-Reductions-Handle Pruning-Shift Reduce Parser-Problems related to Shift Reduce Parsing-Operator Precedence Parser, LEADING, TRAILING -LR Parser- LR Parsers- Need of LR Parsers-LR (0)Item-Closure of Item Sets- Construction of SLR Parsing Table -Problems related to SLR-Construction of Canonical LR(1)- Problems related to CLR - LALR Parser — Problems related to LALR-YACC.

Unit-4 – Code Generation   12 Hour

Intermediate Code Generation- prefix – postfix notation- Quadruple - triple - indirect triples Representation- Syntax tree- Evaluation of expression - Three-address code- Synthesized attributes – Inherited attributes - Intermediate languages – Declarations- Assignment Statements- Boolean Expressions- Case Statements- Back patching – Procedure calls- Code Generation- Issues in the design of code generator- The target machine – Runtime Storage management- A simple Code generator- Code Generation Algorithm- Register and Address Descriptors.

Unit-5 – Code Optimization   12 Hour

Code optimization -Principal Sources of Optimization- Function Preserving Transformation- Loop Optimization- Peephole optimization — DAG- Basic Blocks- Flow Graphs- Global Data Flow Analysis — Efficient Data Flow Algorithm- Runtime Environments- Source Language issues- Storage Organization- Activation Records- Storage Allocation strategies.

Lab Experiments

Lab 1 - Implementation of Lexical Analyzer	Lab9 Computation of LR (0) items
Lab 2 conversion from Regular Expression to NFA	Lab 10-Intermediate code generation – Postfix, Prefix
Lab 3 Conversion from NFA to DFA	Lab 11 Intermediate code generation – Quadruple, Triple, Indirect triple
Lab 4 Elimation of Ambiguity, Left Recursion and Left Factoring	Lab 12: A simple code Generator
Lab 5 -FIRST AND FOLLOW computation	Lab 13 Implementation of DAG
Lab 6 Predictive Parsing Table	Lab 14: Implementation of Global Data Flow Analysis
Lab 7 - Shift Reduce Parsing	Lab 15: Implement any one storage allocation strategies (heap, stack, static)
Lab 8- Computation of LEADING AND TRAILING	

Learning Resources	1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Compilers: Principles, Techniques and Tools, Second Edition, Pearson Education, 2011. 2. S. Godfrey Winster, S. Aruna Devi, R.Sujatha,"Compiler Design", Yesdee Publishing Pvt.Ltd, 2016. 3. K .Muneeswaran,"CompilerDesign", Oxford Higher Education, Fourth Edition, 2015.	4. David Galles, "Modern Compiler Design", Pearson Education, Reprint 2012. 5. Raghavan V., "Principles of CompilerDesign", Tata McGraw Hill Education Pvt. Ltd., 2010.

Learning Assessment

		Continuous Learning Assessment (CLA)				Summative Final Examination (40% weightage)	
	Bloom's Level of Thinking	Formative CLA-1 Average of unit test (45%)		Life-Long Learning CLA-2 (15%)			
		Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	15%	-	-	15%	15%	-
Level 2	Understand	25%	-	-	20%	25%	-
Level 3	Apply	30%	-	-	25%	30%	-
Level 4	Analyze	30%	-	-	25%	30%	-
Level 5	Evaluate	-	-	-	10%	-	-
Level 6	Create	-	-	-	5%	-	-
	Total	100 %		100 %		100 %	

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Saranya Baskar, Lead Software Testing Engineer, EPAM Systems India Private Limited, Hyderabad. saranya_baskar@epam.com	1. Dr. E. Ilavarasan, Professor, Department of Computer Science and Engineering, Puducherry Technological University, Puducherry.	1. Dr. M. Baskar, SRMIST
	2. Dr. M. Shyamala Devi, Professor, Department of Computer Science and Engineering, Vel Tech Rangarajan Dr. Sagunthala R & D Institute of Science and Technology, Chennai.	2. Dr. Godfrey Winster S SRMIST

Course Code	21CSE355T	Course Name	DATA MINING AND ANALYTICS	Course Category	E	PROFESSIONAL ELECTIVE	L	T	P	C
							2	1	0	3

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Program Outcomes (PO)													Program Specific outcomes		
CLR-1:	Introduce the basic concepts of pattern discovery and data preparation	1	2	3	4	5	6	7	8	9	10	11	12				
CLR-2:	Understand the importance of Association and Correlation Algorithms	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern Tool Usage	The engineer and society	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO-1	PSO-2	PSO-3
CLR-3:	Comprehend and apply various Classifiers															
CLR-4:	Work with the foundation for Clustering															
CLR-5:	Perform Outlier Analysis and Explore a data mining tool															

Course Outcomes (CO):	At the end of this course, learners will be able to:															
CO-1:	Do the preprocessing of data before mining of data for patterns	1	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO-2:	Make use of Association and Correlations Algorithms for framing association rules	1	2	-	-	3	-	-	-	-	-	-	-	2	-	-
CO-3:	Apply as well as Compare the performance of various classifiers	1	2	-	-	3	-	-	-	-	-	-	-	2	-	-
CO-4:	Utilize different Clustering algorithms for generalization	1	-	-	-	3	-	-	-	-	-	-	-	2	-	-
CO-5:	Identify Outliers in the data given	1	2	-	-	3	-	-	-	-	-	-	-	2	-	-

Unit-1 - Data Mining Introduction   9 Hour
Introduction: Kinds of Data- Kinds of Patterns-Data Objects and Attribute Type- Data Visualization -Data Preprocessing: Data cleaning, Data Integration, Data Transformation, Data Discretization and Data Reduction: Attribute Subset Selection-Histograms, Clustering, Sampling

Unit-2 - Associations and Correlations   9 Hour
Market Basket Analysis – Apriori Algorithm – Mining Frequent Itemsets without Candidate Generation – Mining Frequent Itemsets Using Vertical Data Format – Mining Closed Frequent Itemsets – Mining Multilevel Association Rules – Mining Multidimensional Association Rules – Correlation Analysis – Constraint-Based Association Mining

Unit-3 - Classification and Prediction   9 Hour
Basic Concepts- Decision Tree Induction-Attribute selection Measures-ID3 and CART algorithms, Tree Pruning-Bayes Classification Methods: Bayes" Theorem, Naive Bayesian Classification - Classification by Backpropagation- Support Vector Machines-Lazy learners: KNN-Metrics for evaluating classifier performance-Techniques to improve classification accuracy-Prediction: Regression Analysis

Unit-4 - Cluster Analysis   9 Hour
Cluster Analysis: Partitioning Methods- Hierarchical Methods: Agglomerative versus Divisive Hierarchical Clustering-Probabilistic Model based Clustering - BIRCH, DBSCAN, STING, CLIQUE Techniques- Evaluation of clustering Techniques

Unit-5 - Outliers and Statistical Approaches in Data Mining   9 Hour
Introduction to outliers, Challenges in detecting Outliers,Outlier Detection Methods - Supervised, Semisupervised, Unsupervised- Statistical Data Mining approaches - Data mining in Recommender Systems,Data mining for Intrusion Detection, Data Mining for Financial Analysis

Learning Resources	1. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Third Edition, Elsevier, 2012
	2. Ian H. Witten, Eibe Frank and Mark A. Hall "Data Mining: Practical Machine Learning Tools and Techniques", Fourth Edition, Elsevier, 2017.

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (CLA)				Summative Final Examination (40% weightage)	
		Formative CLA-1 Average of unit test (50%)		Life-Long Learning CLA-2 (10%)			
		Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	15%	-	15%	-	15%	-
Level 2	Understand	25%	-	20%	-	25%	-
Level 3	Apply	30%	-	25%	-	30%	-
Level 4	Analyze	30%	-	25%	-	30%	-
Level 5	Evaluate	-	-	10%	-	-	-
Level 6	Create	-	-	5%	-	-	-
	Total	100 %		100 %		100 %	

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. T. Ruso, Senior Project Lead, HCL Technologies, Chennai	1. Khanna Nehemiah, Associate Professor, Anna University Chennai	

Course Code	21CSE356T	Course Name	NATURAL LANGUAGE PROCESSING		Course Category	E	PROFESSIONAL ELECTIVE		L	T	P	C
									2	1	0	3

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Program Outcomes (PO)												Program Specific outcomes		
CLR-1:	Understand the fundamentals behind the Language processing and perform word level analysis.	1	2	3	4	5	6	7	8	9	10	11	12			
CLR-2:	Understand the syntactic processing and probabilistic context-free grammars.	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern Tool Usage	The engineer and society	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO-1	PSO-2	PSO-3
CLR-3:	Conceive the basics of the knowledge representation, inference, and discourse analysis.															
CLR-4:	Recognize the significance of transformer-based models.															
CLR-5:	Understand the natural language processing applications and to learn how to apply basic algorithms in this field.															
Course Outcomes (CO):	At the end of this course, learners will be able to:															
CO-1:	Exhibit knowledge on text preprocessing techniques and perform word level analysis.	3	3	2	-	-	-	-	-	-	-	-	-	2	-	-
CO-2:	Illustrate approaches to syntax analysis including probabilistic context-free grammars	3	3	2	-	-	-	-	-	-	-	-	-	2	-	-
CO-3:	Apply approaches to semantics and discourse analysis in NLP.	3	3	2	-	-	-	-	-	-	-	-	-	2	-	-
CO-4:	Develop models using transfer learning approaches.	3	-	-	3	3	-	-	-	-	-	-	-	2	-	-
CO-5:	Implement applications that use Natural Language Processing approaches.	-	-	2	3	3	-	-	-	-	-	-	-	-	-	-

Unit-1 - Overview and Word Level Analysis	9 Hour

Introduction to Natural Language Processing, Applications of NLP, Levels of NLP, Regular Expressions, Morphological Analysis, Tokenization, Stemming, Lemmatization, Feature extraction: Term Frequency (TF), Inverse Document Frequency (IDF), Modeling using TF-IDF, Parts of Speech Tagging, Named Entity Recognition, N-grams, Smoothing.

Unit-2 - Syntax Analysis	9 Hour

Context Free Grammars, Grammar Rules for English, Top-Down Parsing, Bottom-Up Parsing, Ambiguity, CKY Parsing, Dependency Parsing, Earley Parsing - Probabilistic Context-Free Grammars

Unit-3 - Semantic and Discourse Analysis	9 Hour

Representing Meaning, Lexical Semantics, Word Senses, Relation between Senses, Word Sense Disambiguation, Word Embeddings, Word2Vec, CBOW, Skip-gram and GloVe, Discourse Segmentation, Text Coherence, Discourse Structure, Reference Resolution, Pronominal Anaphora Resolution, Coreference Resolution

Unit-4 - Language Models	9 Hour

Recurrent Neural Networks (RNN), Long Short-Term Memory (LSTM), Attention mechanism, Transformer Based Models, Self-attention, multi-headed attention, BERT, RoBERTa, Fine Tuning for downstream tasks, Text classification and Text generation.

Unit-5 - NLP Applications	9 Hour

Introduction to Chatbot Applications, Retrieval based- Conversation based, Information Extraction and its approaches, Information Retrieval, Semantic Search and Evaluation, Question Answering, Summarization, Extractive Vs Abstractive Summarization, Machine Translation.

Learning Resources	1. Daniel Jurafsky and James H Martin, "Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", Prentice Hall, 2nd Edition, 2018. 2. C.Manning and H.Schutze, ―Foundations of Statistical Natural Language Processing‖, MIT Press. Cambridge, MA,1999 3. JamesAllen, Bejamin/cummings, ―NaturalLanguageUnderstanding‖,2ndedition,1995	4. Rothman, Denis. Transformers for Natural Language Processing: Build innovative deep neural network architectures for NLP with Python, PyTorch, TensorFlow, BERT, RoBERTa, and more. Packt Publishing Ltd, 2021. 5. http://mccormickml.com/2106/04/19/word2vec- tutorial-the-skip-gram-model/ 6. https://nlp.stanford.edu/pubs/glove.pdf

Learning Assessment

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Level 4	Analyze	30%	-	30%	-	30%	-
Level 5	Evaluate	-	-	-	-	-	-
Level 6	Create	-	-	-	-	-	-
	Total	100 %		100 %		100 %	

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Dr. J.Balaji, Associate Manager,Allstate Solutions Pvt Ltd, jagank.balaji@gmail.com	1. Dr. Vani. V, Assistant Professor, National Institute of Technology Puducherry	1. Dr. R. Anita, SRMIST.
		2. Dr.Subalalitha C.N , SRMIST
		3. Ms.Viji D , SRMIST