CBCS-Scheme of Instruction for MILE

(Master in Informatics and Language Engineering)

Version1.8

Semester –I

Course Type	Course Code	Course Title	Credit	Contact classes
Base Compulsory		Computer Application	2	30
		Compulsory Language	4	60
Base elective (any one)		Environment Studies	4	60
		Constitution of India	4	60
		Indian Philosophers	4	60
		Human Rights	4	60
Core	M1-CILE101	Language & Linguistics	4	60
	M1-CILE102	Programming Methodology with Java	4	60
Generic elective for other department	M1-CILE103	Fundamental of Informatics	2	60
	M1-CILE104	Fundamental of Cyber Security	2	30
Generic elective from other department (Any one)			2	30
Discipline specific elective (Anyone)	M1-CILE103	Fundamental of Informatics	2	30
	M1-CILE 104	Fundamental of Cyber Security	2	30

Semester -II

Course Type	Course Code	Course Title	Credit	Contact classes
Base Compulsory		Computer Application	2	30
		Compulsory Language	4	60
Core	M1-CILE201	Client Server Computing with JAVA	4	60
	M1-CILE202	Artificial Intelligent	4	60
Generic elective for other departments	M1-CILE203	Database Management System (DBMS)	4	30
	M1-CILE202	Data Structure and Algorithm	2	30
Generic elective from other Departments			6	30
Discipline specific elective	M1-CILE204	C# Programming	2	60
	M1-CILE 205	Data structure and Algorithms	2	30
	M1-CILE203	Database Management System (DBMS)	4	60

Semester III

Course Type	Course Code	Course Title	Credit	Contact classes
Core	HV01- CILE301	Web Technology	4	60
	HV01- CILE302	Natural Language Processing	4	60
	HV01- CILE303	System Analysis & Design	4	60
	HV01- CILE304	Mini Project*	2	30
Generic elective for other department	HV01- CILE301	Web Technology	4	60
	HV01-CILE306	Text Mining	2	30
Generic elective from other department			6	90
Discipline specific electives*	HV01- CILE305	Computer Networks	4	60
	HV01-CILE306	Text Mining	2	30

(Mini Project can be performed in University/during industrial training)

Semester IV

Course Type	Course Code	Course Title	Credit	Contact classes
Core	CILE401*	Digital Speech Processing*	4	60
	CILE402*	Machine Translation*	2	30
	CILE403	Information Retrieval	4	60
	CILE404	Project and viva	4	60
Generic elective for other department	CILE401	Digital Speech Processing	4	30
	CILE405	Cognitive NLP	2	30
Generic elective from other department			6	90
Discipline specific elective	CILE404	Internet of Things	4	60
	CILE405	Cognitive NLP	2	30

(*Courses will be taught through MOOCs Platform considering the constraints)

Course code#	M1-CILE 101
Course Title	Language &Linguistics
Course Type	Core
Prerequisite	Knowledge of language and some knowledge about its elementary grammar.
Credits	4
(L:T:P)	40:20:0 or as per direction given by BOS
Contact Classes	60
Text Books & References	- Aber Crombie (1967) Elements of General Phonetics - Akmajian (2010) An introduction to Language and Communication. 6th edition - Carnie, Andrew. 2002. *Syntax: A Generative Introduction.* Oxford: Blackwell publishers. (2007edition). - Chomsky N. and Halle, M. (1968) The Sound pattern of Linguistics. New York: Harper and Row - Culicover, P.W. 2009. *Natural Language Syntax.* New York: Oxford University Press. - Francis Katamba andJohn Stonham. (2006). Morphology - Fromkin V. (Eds.) 2000. Linguistics: An Introduction to Linguistic Theory, Cambridge and Blackwell. - Haegeman, L. 1991. *Introduction to Government and Binding Theory*, Cambridge: Cambridge University Press. - Haspelmath, M. & Sims, A. (2010). Understanding morphology (2nd edition). London: Hodder Education J. c. Catford (date) Fundamental Problems in Phonetics - Jurafsky, D (et. al.) 2000. *Speech And Language Processing* - Kenneth N. Steven (1998). Acoustics Phonetics

	• Lyons, John. 1997. *Semantics Vol 1 & 2* • Mark Aronoff, Kirsten Fudeman. (2010) What is morphology.Wiley-Blackwell, Second Edition, • Peter Ladefoged (1995). Elements of Acoustic Phonetics. 2nd edition • Radford and Others (2009) Linguistics: An Introduction. 2nd edition • Yule, George (2010). The Study of Language
Other References	Link for various Linguistic Resources: http://www2.gsu.edu/~eslsal/links.htm
Course Objectives	By the end of this course the student will: 1. Understand the foundational concepts of Linguistics. 2. Have the understanding of the nature and features of language. 3. Be able to approach language from scientific perspective. 4. Be able to use the tools of Linguistic analysis in investigating linguistic data and analyzing it. 5. Understand the interdisciplinary aspect of Language and Linguistics.
Course Outline	Introduction: Linguistics- Theoretical Linguistics, Applied Linguistics Levels of Language Sounds: Vowel and Consonant, The Sound patterns of Language, Sound Change, Sound Variation Words: Word Classes, Morphology: Morpheme, Morph and Allomorph, Types of Morpheme, Morphological process: Inflectional and Derivational, Word Formation Process, Morphology across Language Phrases and Sentences, Types of Phrases and sentences, Clause, Sentence Structure, Tree Diagram, Phrase Structure rules, Movement Rules, Empty Category, Different grammatical Approaches Meaning: Semantics, Semantic Features, Semantic Roles, Lexical Relation, Pragmatics: Context, Deixis, Reference, Speech Act Applied Linguistics Introduction: Computational Linguistics, Translation: Machine Translation, Psycholinguistics, Speech Therapy, Language Teaching

Laboratory work/Tutorial /Seminar	Compulsory: Based on course content.
Course outcome	Acquaintance with basics of linguistics-both theory and practice, technical mastery over the application of Language Engineering tools.

Course code#	M1-CILE 102
Course Title	Programming Methodology with Java
Course Type	Core
Prerequisite	Basics of programming methodology and programming concept
Credits	4
(L:T:P)	40:0:20
Contact Classes	60
Text Books & References	Programming with JAVA - E Balgurusamy The Complete Reference – JAVA Herbert Schildt
Other References	
Course Objectives	The student who completes this course will develop an understanding of: 1.Basic concept of Java Programming. 2. How to use programming in day to day applications.
Course Outline	Introduction to Java : Features of java 1.2 JDK Environment & tools., OOPs Concepts, Class, Abstraction , Encapsulation, Inheritance, Polymorphism. Difference between C++ and JAVA , Structure of java program, Data types ,Variables , Arrays,Naming Convention Control statement, Decision Making (if, switch), Looping(for, while) Classes and Objects,Constructor,Implementation of Inheritance,Packages and Interfaces, Abstract classes and methods,Implementation of Polymorphism. Modifiers and Access Control, Exception Handling ,File, IO basics, String handling,Applet.
Laboratory work/Tutorial/Seminar	Lab assignments will be assigned based on course content
Course outcome	Acquainted with basics of java programming and can write the code on given objective.

Course code#	M1-CILE 103
Course Title	Introduction to Informatics
Course Type	Elective
Prerequisite	Computer literacy
Credits	2
L:T:P	20:10:0 or As directed by BOS
Contact Classes	30

Text Books	1.D.S.Yadav, "Fundamental of Information Technology"New age international limited third edition 2006 2.J.Das, SK.Mullick and PK Chatterjee, " Principles of Digital Communication," Wiley Eastern Limited, 2008. 3. Ranjan Bose, "Information Theory Coding and Cryptography," Tata McGraw Hill Education Private Ltd, New Delhi, 2010.
References	Horowitz and sahani," Data structure"
Course Objectives	The student who completes this course will develop an understanding of: · 1.Information technology (IT) and its art, science, and human dimensions · 2The role of IT and its use for problem solving and communication in different contexts. 3 The personal, organizational, and social issues brought about by ubiquitous use of Information Technology.
Course Outline	Introducing the field of information technology and its application to other disciplines,Concepts in Information and processing Social and Ethical aspects of IT · Privacy and Security · Data, information, knowledge · Number systems, data representation (Binary, Octal, Hexadecimal, bit, byte, etc.), encoding and information theory. Evolution of computer Generation,Introduction to Hardware (CPU, memory, storage, etc.) · Introduction to problem solving, algorithms, flow charts, pseudocoding ·Sets, its operation and its relationship to relational databases · Introduction to programming · Introduction to data structure, Data management,Introduction to networking, distributed computing, world wide web, e-commerce, e-education. Information security.
Laboratory work /Tutorial/ Seminar	Lab assignments/Tutorial/Seminar will be conducted based on course content
Course outcome	Acquainted with basics of informatics and its application areas.

Course code#	M-CILE 104
Course Title	Fundamental of Cyber Security
Prerequisite	Basics of Computer and information technology.
Credit	2
L:T:P	20:10:0 or As directed by BOS
Contact Classes	30
Text Books	1. Cyber Security,NinaGodbole, SunitBelapure, Paperback – 2011 2. Cryptography and Network security, William Stallings, Pearson education 2010 3. Cryptography and Network security, Behrouz A Forouzan and debdeepMukhopadhyay, paperblack 2010.
References	
Course Objectives	The student who completes this course will develop an understanding of:

	1.Components of cybersecurity and network architecture 2.Distinguished system and application security threats and vulnerabilities 3.Describe different classes of attacks and incidences
Course Outline	Security principals, threats and attacks, Social Engineering attacks Information security, confidentiality, integrity. Internet protocol address, Information Gathering and scanning, Windows security, Email Security, Web security, Authentication and access control, Identification, Authentication by passwords, protecting pass words, Access control structures Cryptography, cryptographic mechanism digital signature Network security, IP security, firewalls, intrusion detection
Laboratory work /Tutorial/ Seminar	Lab work /Tutorial/seminar will be conducted based on course content
Course outcome	Learn to apply the modern principal of security, authentication and access control

Course code#	M1-CILE 201
Course Title	Client Server Computing with Java
Course Type	Core
Prerequisite	M1-CILE103
Credits	4
(L:T:P)	3:0:1
Contact Classes	60
Text Books & References	"JDBC, Servlet and JSP Black Book" by Santosh Kr. K. (Dreamtech) Complete Reference – HerbeltShieldt Programming in java - Black Book Series
Other References	www.sun.com
Course Objectives	The student who completes this course will develop an understanding of: concepts of advanced programming and practice on reusing components. It focuses on Graphical User Interface (GUI), multithreading, networking, and database manipulation.
Course Outline	JDBC:The design of JDBC,Basic JDBS program Concept,Drivers Making the Connection, Statement , ResultSet,Executing SQL commands Executing queries, MetaData MultiThreading:Threadingbasics,Life cycle of thread,Creating Threads Priorities and Synchronization,Inter Thread Communication,RunnableInterfac Servlet: Introduction, Life cycle of servlet, Types of servlet, Session Tracking Cookie class, Servlet- Jdbc Introduction to JSP Getting Familiar with JSP Server, First JSP, Adding Dynamic contents via expressions, Scriptlets, Mixing Scriptlets and

	HTML
	Directives, Declaration, Tags and Session
	Remote Method Invocation, Networking, Java Beans
Laboratory work	Lab assignments will be assigned based on course content
Course outcome	After completion of the course the students will learn to develop web application with Java Technologies

Course code#	M1-CILE 203
Course Title	Artificial Intelligence
Course Type	Core
Prerequisite	HV01-CILE101,HV01-CILE 102
Credits	4
(L:T:P)	4:0:1 or as per direction of BOS
Contact Classes	60
Text Books & References	Artificial Intelligence: A new synthesis, Nils J Nilsson, Morgan Kaufmann Publishers. Artificial Intelligence, 2nd ed., Rich, Tata McGraw Hill. • Artificial Intelligence, R.B. Mishra, PHI, India, 2010. Ben Shneiderman:"Designing the User Interface", Pearson Education. R. Beale, A.J. Dix, J. E. Finlay, G. D. Abowd "Human-Computer Interaction",Prentice-Hall. Joann Hackos, Janice Redish, "User and Task Analysis for Interface Design",Wiley. Jeff Raskin, "The Humane Interface", Pearson Education. Jesse James Garrett, 'The Elements of User Experience", New Riders. A Guide to Expert Systems By Donald A. Waterman, Pearson Introduction to Artificial Intelligence & Expert Systems By Dan W. Patterson, PHI Fuzzy Logic By John Yen, Reza Langari, Pearson Expert Systems - Theory & Practice, By Ermine, Jean Louis, PHI Expert System in Engineering, By D. T. Priam, JFS Pub. Expert System Applications By SumitVadera, Sigma Press Artificial Intelligence By Winston P.H., Pearson
Other References	
Course Objectives	Introduce the concepts of Artificial Intelligence.
Course Outline	Introduction and historical perspective, Hard and Soft AI – disciplines and applications, Theories of Intelligence, Detecting and Measuring Intelligence, Knowledge based approach, the preparedeliberate engineering trade-off, Procedural v/s Declarative knowledge, Criticism of symbolic AI, Knowledge representation, desirable properties of KR schemata, Use of predicate calculus in AI. Unification and Resolution, Architecture, design and manipulation of semantic networks, Frame Systems, Property Inheritance, Procedure Attachment, Conceptual Dependency, Current research areas in knowledge representation, Introduction to Natural Language,

	Processing, Syntax-SemanticsPragmatics-Discourse analysis hierarchy, Recursive and Augmented – Transition Networks. Expert Systems, Components, Production rules, Backwards vs Forward reasoning, Statistical reasoning, certainty factors, measure of belief and disbelief, Meta level knowledge, Introspection, Knowledge engineering case studies, Heuristic search of state space, DFS, BFS, UCS, choice of a search algorithm, Admissibility theorems, search performance metrics, Game playing, Alpha-Beta pruning, Quiescence search, Killer Move heuristic, AI programming environments. AI oriented language and architecture – requirements and taxonomy, Case studies.
Laboratory work	Based on course content.
Course outcome	Understand the concepts Artificial Intelligence.

Course code#	HV01 – CILE 202
Course Title	Database Management System
Course Type	Elective
Prerequisite	HV01- CILE202
Credits	4
(L:T:P)	3:0:1 or as per direction of BOS
Contact Classes	60
Text Books & References	A Silberschatz, H Korth, S Sudarshan, "Database System and Concepts", fifth Edition McGraw-Hill , Rob, Coronel, "Database Systems", Seventh Edition, Cengage Learning. Date, C.J., Introduction to Database Systems (7th Edition) Addison Wesley, 2000 Leon, Alexis and Leon, Mathews, Database Management Systems, LeonTECHWorld ElamasriR .andNavathe, S., Fundamentals of Database Systems (3 rd Edition), Pearsson Education, 2000.
Other References	
Course Objectives	Knowledge of DBMS, both in terms of use and implementation/design v Experience with SQL v Increased proficiency with the programming language.
Course Content	Introduction to Databases and Transactions: What is database system, purpose of database system, view of data, relational databases, database architecture, transaction management, Data Models The importance of data models, Basic building blocks, Business rules, The evolution of data models, Degrees of data abstraction. Database Design ,ER-Diagram and Unified Modeling Language Database design and ER Model:overview, ER-Model, Constraints, ER-Diagrams, ERD Issues, weak entity sets, Codd's rules, Relational Schemas, Introduction to UML Relational database model: Logical view of data, keys, integrity rules. Relational Database design: features of good relational database design, atomic domain and Normalization (1NF, 2NF, 3NF, BCNF).

	Relational Algebra and Calculus Relational algebra: introduction, Selection and projection, set operations, renaming, Joins, Division, syntax, semantics. Operators, grouping and ungrouping, relational comparison. Calculus: Tuple relational calculus, Domain relational Calculus, calculus vs algebra, computational capabilities. Constraints, Views and SQL What is constraints, types of constrains, Integrity constraints, Views: Introduction to views, data independence, security, updates on views, comparison between tables and views SQL: data definition, aggregate function, Null Values, nested sub queries, Joined relations. Triggers. Transaction management and Concurrency control Transaction management: ACID properties, serializability and concurrency control, Lock based concurrency control (2PL, Deadlocks),Time stamping methods, optimistic methods, database recovery management
Laboratory work	Lab assignments will be assigned based on course content with Structured Query language.
Course outcome	Creating, adding deleting and retrieval of data.
Course code#	HV01 – CILE 205
Course Title	Data Structure and Algorithm
Course Type	Elective
Prerequisite	HV01- CILE103
Credits	2
(L:T:P)	2:0:0 or as per direction of BOS
Contact Classes	30
Text Books & References	1. "Introduction to Data Structures" - Bhagat Singh & T.L. Naps. 2. "Data structures using C"-Tanenbaum, Langsam, Augenstein PHI 3. "Classic Data Structures", - D. Samanta PHI 4. "Data structure and Program design in C" - Kruse, Leung, Tondo (PHI) 3. "Data structure" –Tenanbaum 4. "Data structure algorithms and Applications in C++ ": SartajSahaniMacgraw Hill 5. "Data structure and algorithm analysis in C++ ": Mark Allan Welss, Addison weslay
Other References	
Course Objectives	
Course Content	Introduction, Types of Data Structures, Linear & Nonlinear data structures, Arrays: Arrays as ADT, 1D, 2D, Multidimensional Arrays, Memory Representation and Applications. Linked List : Concept , Operations : Insert, Delete, Traversal, Static implementation using arrays,Dynamic implementation , Doubly Linked list, Circular list,Linked list applications : Merging of two linked lists. Stacks: Introduction, Push and Pop operations, Stack implementation using array, Stack applications, Infix to Postfix conversion of expression, Expression evaluation, Recursion. Queues: Introduction, Insert and Delete operations, Queue implementation using array, Types –Priority Queue, Circular queue, Dequeue, Queue applications: CPU Scheduling Algorithms FCFS , Round Robin algorithm, Stacks and Queues as Linked Lists Trees:Terminology and Concepts , Binary Tree Representation, Static implementation using arrays , Linked representation, Binary Search Tree,

	Operations on Binary search tree - Insert, Delete, Tree Traversals, Representing, Threaded binary trees, Height-balanced trees, AVL Rotations. Searching: Sequential binary tree searches.
	Searching and Sorting :Searching, Concept and need, Techniques, Linear search, Binary search, Indexed sequential search, Sorting, Concept and Need, Performance criteria, Bubble sort, Insertion Sort, Selection Sort, Shell Sort, Quick Sort, Heap Sort, Merge Sort.
	Graphs :Terminology and concepts, Graph Representation: Adjacency matrix, Adjacency list, Adjacency multi-list, Traversals: Depth first and Breadth first. Minimum spanning tree, shortest path algorithm, topological ordering, sparse matrices, linked list implementation of graph and graph traversal. Unit VI1: Indexing: B-tree indexing, Multilevel indexing, B+ tree, Hashing, Collision processing, Bucket hashing, Dynamic hashing, Linear hashing, Extendible hashing, Tries.
Laboratory work	
Course outcome	

Second Year MILE-Semester I

Course code#	HV01- CILE 301
Course Title	Web Technology
Course Type	Core
Prerequisite	HV01-CILE102, HV01-CILE103, HV01-CILE201, HV01-CILE202
Credits	4
(L:T:P)	3:0:1or as per direction of BOS
Contact Classes	60
Text Books & References	Web Design The complete Reference, Thomas Powell, Tata McGrawHill
	HTML and XHTML The complete Reference, Thomas Powell, Tata McGrawHill
	JavaScript 2.0 : The Complete Reference, Second Edition by Thomas Powell and Fritz Schneider
	PHP : The Complete Reference By Steven Holzner, Tata McGrawHill
	A beginner's guide to HTML NCSA,14th May,2003
	Murray,Tom/Lynchburg Creating a Web Page and Web Site College,2002 Murray,Tom/Lynchburg Creating a Web Page and Web Site College,2002
	Kogent Learning Solutions Inc. HTML5 in simple steps, Dreamtech Press
	Web Technologies, Godbole ,Khate, McGraw Hill Education; Third edition.
	Web Technology: Theory and Practice, Srinivasan, Pearson Education India; First edition.
	Basics of Networking Paperback, NIIT, Prentice Hall India

	Learning PrivaLimite(2003). DATA COMMUNICATIONS AND NETWORKING (SIE)1 July 2017 byBehrouz A. Forouzan, McGraw Hill Education; 4 edition.
Other References	www.W3schools.com
Course Objectives	The student who completes this course will develop an understanding of: concepts of web programming and develop wesites for various purpose.
Course Content	**Network history**, OSI model,Protocols,Internet and WWW : What is Internet?, Introduction to internet and its applications, E- mail, telnet, FTP, e-commerce, video conferencing, e-business. Internet service providers, domain name server, internet address World Wide Web (WWW) : World Wide Web and its evolution, uniform resource locator (URL), browsers - internet explorer, netscape navigator, opera, firefox, chrome, mozilla. Search engine, web saver - apache, IIS, proxy server, HTTP protocol. **HTML and Graphics** : HTML Tag Reference, Global Attributes, Event Handlers, Document Structure Tags, Formatting Tags, Text Level formatting, Block Level formatting, List Tags, Hyperlink tags, Image and Image maps, Table tags, Form Tags, Frame Tags, Executable content tags. Imagemaps : What are Imagemaps? Client-side Imagemaps, Server-side Imagemaps, Using Server-side and Client-side Imagempas together, alternative text for Imagemaps, Tables : Introduction to HTML tables and their structure, The table tags, Alignment, Aligning Entire Table, Alignment within a row, Alignment within a cell, Attributes, Content Summary, Background color, Adding a Caption, Setting the width, Adding a border, Spacing within a cell, Spacing between the cells, spanning multiple rows or columns, Elements that can be placed in a table, Table Sections and column properties, Tables as a design tool **Frames** : Introduction to Frames, Applications, Frames document, The tag, Nesting tag, Placing content in frames with the tag, Targeting named frames, Creating floating frames, Using Hidden frames, Forms : Creating Forms, Style Sheets : What are style sheets?, Why are style sheets valuable? Different approaches to style sheets, Using Multiple approaches, Linking to style information in s separate file, Setting up style information, Using the tag, embedded style information, Using Java Script : Introduction, Client-Side JavaScript, Server-Side JavaScript, JavaScript Objects, JavaScript Security, Operators : Assignment Operators, Comparison Operators, Arithmetic Operators, % (Modulus), ++ (Increment), -- (Decrement), -(Unary Negation), Logical Operators, Short-Circuit Evaluation, String Operators, Special Operators, ? (Conditional operator), ,(Comma

	operator), delete, new, this, void Statements : Break, comment, continue, delete, do … while, export, for, for…in, function, if…else, import, labelled, return, switch, var, while, with, Core JavaScript (Properties and Methods of Each) : Array, Boolean, Date, Function, Math, Number, Object, String, regExp Document and its associated objects : document, Link, Area, Anchor, Image, Applet, Layer Events and Event Handlers : General Information about Events, Defining Event Handlers, event, onAbort, onBlur, onChange, onClick, onDblClick, onDragDrop, onError, onFocus, onKeyDown, onKeyPress, onKeyUp, onLoad, onMouseDown, onMouseMove, onMouseOut, onMouseOver, onMouseUp, onMove, onReset, onResize, onSelect, onSubmit, onUnload XML : Introduction to XML, Anatomy of an XML, document, Creating XML Documents, Creating XML DTDs, XML Schemas, XSL PHP : Why PHP and MySQL?, Server-side web scripting, Installing PHP, Adding PHP to HTML, Syntax and Variables, Passing information between pages, Strings, Arrays and Array Functions, Numbers, Basic PHP errors / problems. Advanced PHP and MySQL : PHP/MySQL Functions, Displaying queries in tables, Building Forms from queries, String and Regular Expressions, Sessions, Cookies and HTTP, Type and Type Conversions, E-Mail
Laboratory work	Lab assignments will be assigned based on course content
Course outcome	After completion of the course the students will learn to develop web application.

Course code#	HV01-CILE 302
Course Title	Natural Language Processing
Course Type	Core
Prerequisite	HV01-CILE203 basic programming skills • general understanding of Calculus and Statistics
Credits	4
(L:T:P)	3:0:1or as per direction of BOS
Contact Classes	60
Text Books & References	Speech and Language processing An introduction to Natural Language Processing, Computational Linguistics and speech Recognition by Daniel Jurafsky and James H. Martin (ISBN13: 978-0131873216) 2. Natural Language Processing with Python by Steven Bird, Ewan Klein, Edward Lopper(ISBN13:978-0596516499)
Other References	
Course Objectives	This course introduces the fundamental concepts and techniques of natural language processing (NLP). Students will gain an in-depth

	understanding of the computational properties of natural languages and the commonly used algorithms for processing linguistic information. The course examines NLP models and algorithms using both the traditional symbolic and the more recent statistical approaches. to learn about basic NLP problems, tasks and methods; • to master basic programming tools for NLP.
Course Content	Introduction: Knowledge in speech and language processing, Ambiguity, Models and Algorithms, Brief History Regular Expressions and Automata: Regular Expressions, Finite-State Automata, Regular Languages and FSA Morphology and Transducers: Inflectional and derivational morphology, finite state morphological parsing, Combining FST Lexicon and rules. Lexicon free FST: Porter Stemmer N-grams: Counting Words in Corpora, SIMPLE (UNSMOOTHED) N-GRAMS, Smoothing, Entropy HMM and Speech Recognition: Speech Recognition Architecture, Overview of HMM, A* decoding Word Classes and Part-of-Speech Tagging: English word classes, Targets for English, Part of speech Tagging, Rule Based part of speech Tagging, Transformation Based Tagging. Context Free Grammars for English: Constituency, Context Free rules and Trees, Sentence level construction, The Noun Phrase, Coordination, Agreement, The verb phrase and sub-categorization. Spoken Language Syntax, Grammar Equivalence and Normal form, Finite state context free grammars, Grammar and human processing. Parsing with context free grammars: Parsing as Search, Basic Top down Parser, Problems with basic top-down-parsers, the early Algorithm, Finite state parsing method Features and Unifications: Feature structures, Unification of Features Structures, Features Structures in the grammar, Implementing Unification. Lexicalized and probabilistic parsing: Probabilistic context free grammars, problems with probabilistic context free grammars, probabilistic lexicalized GFG Module III Semantics Representing Meaning: Computational Desiderata for representation, Meaning structure of language, First order predicate calculus, linguistically relevant concept, Related Re-presentational approaches, Alternative approaches to meaning. Semantic Analysis: Syntax driven semantic analysis, Attachment of Fragment of English, Integrating semantic analysis with early parser. Robust Semantic Analysis. Lexical Semantics: Relation among lexemes and their senses, Internal Structure of words. Module IV Pragmatics Discourse: Reference resolution, Text Coherence, Discourse Structure, Psycholinguistics Studies of reference and coherence. Natural Language generation: Introduction to language generation, Architecture for generation, Surface realization, Discourse planning, Macro planning, Lexical selection, evaluating generation systems, generating speech
Laboratory work	Lab assignments will be assigned based on course content
Course outcome	A • programming skills: implementing a simple NLP systems; • analytical skills: define a NLP problem and find a suitable solution

	to it; • presenting skills: demonstrating your own program solution.

Course code#	CILE 303
Course Title	system analysis and design
Course Type	Core
Prerequisite	CILE 102
Credits	
(L:T:P)	3:0:1
Contact Classes	60
Text Books & References	Systems Analysis and Design, Eight Edition by Kenneth E. Kendall & Julie E. Kendall, Pearson, 2011, ISBN-10: 0-13-509490-9 System Analysis & Design Methods, Seventh Edition by Jeffery L. Whitten, Lonnie D. Bentley McGraw Hill, 2007, ISBN 0073052337 Modern Systems Analysis and Design, Sixth Edition by Jeffrey A. Hoffer; Joey F. George; Joseph S. Valacich, Prentice Hall, 2011, ISBN-10: 0-13-608821-X
Other References	Object-Oriented systems Analysis and Design Using UML, 4th Edition by Simon Bennett, Steve McRobb and Ray Farmer, McGraw Hill, 2010, ISBN-10: 007712536-3
Course Objectives	Prepare students towards. The system development lifecycle
Course Content	Systems Analysis Fundamentals: Understanding and Modeling Organizational Systems Systems Analysis Fundamentals: Project Management Information Requirements Analysis: Information Gathering, Information Requirements Analysis: Agile Modeling and Prototyping

The Analysis Process: Using Data Flow Diagrams The Analysis Process: Object-Oriented Systems Analysis and Design using UML. The Essentials of Design Designing Effective Output The Essentials of Design: Designing Databases The Essentials of Design: Human–Computer Interaction. Quality Assurance and Implementation |
| **Laboratory work** | Lab assignments will be assigned based on course content |
| **Course outcome** | Understands the concept of system development and documentation |

Course code#	CILE 305
Course Title	Text Mining
Course Type	Elective
Prerequisite	

Credits	2
(L:T:P)	2:0:0
Contact Classes	30
Text Books & References	THE TEXT MINING HANDBOOK Advanced Approaches in Analyzing Unstructured Data by Ronen Feldman Bar-Ilan University, Israel James Sanger ABS Ventures, Waltham, Massachusetts Text Mining with R: A Tidy Approach by Julia Silge and David Robinson
Other References	Text Analytics with Python: A Practical Real-World Approach to Gaining Actionable Insights from your Data by Dipanjan Sarkar
Course Objectives	
Course Content	Introduction to Text Mining : Defining Text Mining , General Architecture of Text Mining Systems . Core Text Mining Operations : Core Text Mining Operations , Using Background Knowledge for Text Mining , Text Mining Query Languages Text Mining Preprocessing Techniques : Task-Oriented Approaches, Categorization : Applications of Text Categorization , Definition of the Problem , Document Representation , Knowledge Engineering Approach to TC , Machine Learning Approach to TC , Using Unlabeled Data to Improve Classification, Evaluation of Text Classifiers. Clustering: Clustering Tasks in Text Analysis , The General Clustering Problem , Clustering Algorithms , Clustering of Textual Data Text Mining Applications: General Considerations, Corporate Finance: Mining Industry Literature for Business, A "Horizontal" Text Mining Application: Patent Analysis Solution Leveraging a Commercial Text Analytics Platform, Life Sciences Research: Mining Biological Pathway Information with GeneWays
Laboratory work	-
Course outcome	

Course code#	CILE 304
Course Title	Mini Project
Course Type	Elective I *

Prerequisite	CILE102,CILE103,CILE201, CILE202
Credits	2
(L:T:P)	0:0:2
Contact Classes	30
Text Books & References	
Other References	https://www.wrike.com/project-management-guide/
Course Objectives	Develop the application/website/tool/system software related to Natural language processing with reference to Hindi Language.
Course Content	As directed and suggested by Project guide.
Laboratory work	Lab work based on the topic chosen for miniproject
Course outcome	Experience and hands on for development of application.

Second Year MILE-Semester IV

Course code#	CILE 401
Course Title	Digital Speech Processing,
Course Type	Core
Prerequisite	CILE301
Credits	4
(L:T:P)	3:0:1
Contact Classes	60
Text Books & References	Rabiner and Schafer: Theory and Applications of Digital Speech Processing, Prentice Hall R&J: Rabiner and Juang: Fundamentals of Speech Recognition, Prentice Hall
Other References	HAH: Huang, Acero, and Hon: Spoken Language Processing, Prentice Hall
Course Objectives	The student who completes this course will develop an understanding of: concepts of web programming and develop websites for various purpose.
Course Content	Introduction , The Speech Signal: Phonetic Representation of Speech,. Hearing and Auditory Perception: The Human Ear, Perception of Loudness , Short-Time Analysis of Speech: Short-Time Energy and Zero-Crossing Rate, Homomorphic Speech Analysis: Definition of the Cepstrum and Complex Cepstrum, The Short-Time Cepstrum, The Role of the Cepstrum Linear Predictive Analysis: Linear Prediction and the Speech Model, The Role of Linear Prediction , Digital Speech Coding,: Sampling and Quantization of Speech (PCM),

	Text-to-Speech Synthesis Methods: Text Analysis ,Evolution of Speech Synthesis Systems , TTS Applications and future needs Automatic Speech Recognition (ASR) : The Problem of Automatic Speech Recognition ,Building a Speech Recognition System, Challenges in ASR Technology
Laboratory work	Lab assignments will be assigned based on course content
Course outcome	After completion of the course the students will learn to develop application and tools related to DSP.

Course code#	CILE 402
Course Title	Machine Translation
Course Type	Core
Prerequisite	CILE301
Credits	2
(L:T:P)	2:0:0
Contact Classes	60
Text Books & References	Machine Translation: An Introductory Guide by Doglous Arnold NCC Blackwell London Statistical Machine Translation **By Philipp Koehn,Cambridge University Press**
Other References	http://cognet.mit.edu/book/readings-machine-translation https://www.blogs.uni-mainz.de/fb06-tc3/files/2015/11/28-143-1-PB.pdf file:///C:/Documents%20and%20Settings/MGAHVBHASHA/My%20Documents/Downloads/Machine%20Translation.pdf
Course Objectives	Obtain a basic understanding of MT systems and MT-related issues Learn about theory and approaches in MT Learn about basic techniques for MT development
Course Content	Introduction :Popular Conceptions and Misconceptions ,A Bit of History Machine Translation in Practice: Introduction: Document Preparation: Authoring and Pre-Editing ,The Translation Process , Document Revision Representation and Processing: IntroductionRepresenting Linguistic Knowledge, Processing . Machine Translation Engines: Introduction ,Transformer Architectures ,Linguistic Knowledge Architectures, Dictionaries: Introduction, Paper Dictionaries, Types of Word Information,Dictionaries and Morphology, Translation Problems: Introduction, Ambiguity, Lexical and Structural Mismatches, Multiword units: Idioms and Collocations, Representation and Processing Revisited: Meaning Introduction, Semantics, Pragmatics, Real World Knowledge, Input: The Electronic Document, Controlled Languages, Sublanguage MT , Evaluating MT Systems: Introduction,Some Central Issues

	Evaluation of Engine Performance : Operational Evaluation, New Directions in MT: Introduction, Rule-Based MT ,Resources for MT,Empirical Approaches to MT.
Laboratory work	--
Course outcome	This course will equip the students with history of machine translation, types of machine translation systems, approaches to machine translation, evaluations of machine translation systems, and the use of machine translation systems in different domains.

Course code#	CILE 403
Course Title	Information Retrieval
Course Type	Core
Prerequisite	Advanced Programming Techniques
Credits	
(L:T:P)	3:0:1
Contact Classes	60
Text Books & References	Manning, Raghavan and Schutze, Introduction to Information Retrieval, Cambridge University Press. Baeza-Yates and Ribeiro-Neto, Modern Information Retrieval, Addison-Wesley.
Other References	http://cse.iitkgp.ac.in/ SoumenCharabarti, Mining the Web, Morgan-Kaufmann. Survey by Ed Greengrass available in the Internet.
Course Objectives	To apply information retreival principles to locate relevant information in large collections of data, understand and deploy efficient techniques for the indexing of document objects that are to be retrievedand implement features of retrieval systems for web-based and other search tasks.
Course Content	Introduction to Information Retrieval: The nature of unstructured and semi-structured text. Inverted index and Boolean queries. Text Indexing, Storage and Compression: Text encoding: tokenization, stemming, stop words, phrases, index optimization. Index compression: lexicon compression and postings, lists compression. Gap encoding, gamma codes, Zipf's Law. Index construction. Postings size estimation, merge sort, dynamic indexing, positional indexes, n-

	gram indexes, real-world issues. Retrieval Models: Boolean, vector space, TFIDF, Okapi, probabilistic, language modeling, latent semantic indexing. Vector space scoring. The cosine measure. Efficiency considerations. Document length normalization. Relevance feedback and query expansion. Rocchio. Performance Evaluation: Evaluating search engines. User happiness, precision, recall, F-measure. Creating test collections: kappa measure, interjudge agreement. Text Categorization and Filtering: Introduction to text classification. Naive Bayes models. Spam filtering. Vector space classification using hyperplanes; centroids; k Nearest Neighbors. Support vector machine classifiers. Kernel functions. Boosting. Text Clustering: Clustering versus classification. Partitioning methods. k-means clustering. Mixture of Gaussians model. Hierarchical agglomerative clustering. Clustering terms using documents. Advanced Topics: Summarization, Topic detection and tracking, Personalization, Question answering, Cross language information retrieval. Web Information Retrieval: Hypertext, web crawling, search engines, ranking, link analysis, PageRank, HITS, XML and Semantic web.
Laboratory work	Based on the course content
Course outcome	Students will be able to apply information retreival principles to locate relevant information in large collections of data understand and deploy efficient techniques for the indexing of document objects that are to be retrieved and implement features of retrieval systems for web-based and other search tasks.

Course code#	CILE 405
Course Title	Machine Learning
Course Type	

Prerequisite	-
Credits	2
(L:T:P)	0:0:0
Contact Classes	--
Text Books & References	Machine Learning in Action by Peter Harrington
Other References	Machine Learning by Tom Mitchell
Course Objectives	To introduce students to the basic concepts and techniques of Machine Learning. To develop skills of using recent machine learning software for solving practical problems. To gain experience of doing independent study and research.
Course Content	Machine Learning basics, classifying with k-nearest neighbors, decision trees, classifying with probability theory: naive Bayes, logistic regression, support vector machines, Predicting numeric values with regression, Tree based regression. Unsupervised learning: grouping unlabeled items using k-means clustering, association analysis with apriority algorithm, efficiency finding frequency itemsets with FP-growth.
Laboratory work	--
Course outcome	

Course code#	CILE 406
Course Title	Internet of Things
Course Type	
Prerequisite	-
Credits	2
(L:T:P)	2:0:0
Contact Classes	30
Text Books & References	Vijay Madisetti, Arshdeep Bahga," Internet of Things A Hands-On-Approach",2014 Internet of Things : A hands- on Approach by Arsheep Bahga (Author), Vijay Madisetti (Author) IOT (Internet of Things) Programming: A Simple and Fast Way of Learning IOT by David Etter
Other References	Kurose, James F.; Ross, Keith W.Computer networking : a top-down approach Adrian McEwen, "Designing the Internet of Things", Wiley Publishers, 2013 Daniel Kellmereit, "The Silent Intelligence: The Internet of Things". 2013
Course Objectives	Students will be exploring the interconnection and integration of the physical world and the cyber space. They are also able to design &

	develop IOT Devices.
Course Content	Internet in general and Internet of Things: layers, protocols, packets, services, performance parameters of a packet network as well as applications such as web, Peer-to-peer, sensor networks, and multimedia. Transport services: TCP, UDP, socket programming. Network layer: forwarding & routing algorithms (Link, DV), IP-addresses, DNS, NAT, and routers. Local Area Networks, MAC level, link protocols such as: point-to-point protocols, Ethernet, WiFi 802.11, cellular Internet access, and Machine-to-machine. Mobile Networking: roaming and handoffs, mobile IP, and ad hoc and infrastructure less networks. Real-time networking: soft and real time, quality of service/information, resource reservation and scheduling, and performance measurements. IoT definitions: overview, applications, potential & challenges, and architecture. IoT examples: Case studies, e.g. sensor body-area-network and control of a smart home.
Laboratory work	--
Course outcome	Explain in a concise manner how the general Internet as well as Internet of Things work. Understand constraints and opportunities of wireless and mobile networks for Internet of Things. Use basic measurement tools to determine the real-time performance of packet based networks. Analyse trade-offs in interconnected wireless embedded sensor networks.