Bachelor of Technology

Computer Science & Engineering

(Artificial Intelligence & Machine Learning)

Four-Year Graduate Programme

(5^{th}& 6^{th} Semester only)

Learning Outcomes based Curriculum Framework

(LOCF)

For

Curriculum for 3^{rd}Year onwards

For 2023-24 Batch onwards

Department ofComputer Science & Engineering

Faculty of Engineering and Technology

Chaudhary Devi Lal University

Sirsa-125055

For Batch 2023-24 onwards

The Curriculum Book

Bachelor of Technology

Computer Science & Engineering

(Artificial Intelligence & Machine Learning)

4-YEAR PROGRAMME

– (5th & 6th Sem only)

Choice Based Credit System with

Learning Outcomes based Curricular Framework

w. e. f. 2023-24

BoS/3-7-2025

Committee

Staff Council (26/3/25)

Faculty of E&T (4/7/25)

Department of Computer Science & Engineering

Faculty of Engineering and Technology

Chaudhary Devi Lal University

Sirsa-125055

BoS (26/3/25)

Program Specific Outcomes (PSOs)

PSO1 **Developing Computational Systems**: Use principles of various programming languages, data structures, database management systems, computer algorithms, theory of computation, networking and software engineering for designing and implementing computational systems.

PSO2 **Designing Intelligent Machine Learning Systems:** Utilize the principles and tools of artificial intelligence, soft computing, data mining and machine learning, data analytics, robotics, IoT, augmented reality etc. for designing and working with intelligent systems that learn from their environment.

Course Code	**Definition/ Category**
HSMC	Humanities, Social Sciences and Management Courses
BSC	Basic Science Courses
ESC	Engineering Science Courses
PC	Program Core Courses (Branch specific)
PE	Professional Elective Courses (Branch specific)
OE	Open Elective Courses (from Humanities, Technical Emerging or other Subjects)
EEC	Employability Enhancement Courses (Project work/ Summer Training/ Industrial Training/ Practical Training/ Internship/Seminar, etc.)
AU	Audit Courses [Environmental Sciences, Indian Constitution]

SemesterI					
Sr. No	**CourseCode**	**CourseTitle**	**L**	**P**	**Credits**
1.	MC/1	3-WeekInduction Programme	-	-	-
2.	*HSMC/1-T	CommunicationSkills	3	-	-
3.	BSC/1-T	Mathematics-I	4	-	4
4.	ESC/1-T	Computer Fundamentals	3	-	3
5.	PC/CSEAIML/1-T	Database Concepts	3	-	3
6.	ESC/2-T	ProblemSolvingandProgramming	4	-	4
7.	PC/CSEAIML/1-P	Database Concepts Lab (SQL)	-	4	2
8.	ESC/2-P	Problem Solving andProgramming Lab (C language)	-	4	2
				Total Credit	**18**

SemesterII					
Sr. No	**CourseCode**	**CourseTitle**	**L**	**P**	**Credits**
1.	BSC/2-T	Mathematics-II	4	-	4
2.	PC/CSEAIML/2-T	ObjectOrientedProgramming	3	-	3
3.	PC/CSEAIML/3-T	DataStructures	4	-	4
4.	ESC/3-T	Mathematical Concepts for Artificial Intelligence	3	-	3
5.	PC/CSEAIML/4-T	Computer Organization and Architecture	4	-	4
6.	**HSMC/2-T	Universal Human Values-I	3	-	-
7.	PC/CSEAIML/2-P	Object Oriented Programming Lab	-	4	2
8.	PC/CSEAIML/3-P	Data Structures Lab	-	4	2
				Total Credit	**22**

*Non-credit mandatory course.

**Non-credit mandatory course. Internal evaluation only.

Note:

1. Students may go for summer training of 4-6 weeks after 2nd Semester, 4th Semester and 6th Semester. Students will have to complete any two (02) summer trainings out of three (03)
2. Students will submit certificate of training in the beginning of next semester at the end of which training is completed.
3. Internal evaluation of training will be made on the basis of open presentation.

SEMESTER-III

Sr. No.	Course Codes	Nomenclature of the Courses	Workload/Credits				Marks		
			L	T	P	Total	Internal	External	Marks
1.	BSC/3-T	Mathematic III	4/4	-	-	4/4	30	70	100
2.	PC/CSEAIML/5-T	Operating System	3/3	-	-	3/3	30	70	100
3.	PC/CSEAIML/6-T	Java Programming	4/4	-	-	4/4	30	70	100
4.	PC/CSEAIML/7-T	R for Data Analytics	4/4	-	-	4/4	30	70	100
5.	PC/CSEAIML/6-P	Lab- Java Programming	-	-	4/2	4/2	25	25	50
6.	PC/CSEAIML/7-P	Lab- R for Data Analytics	-	-	4/2	4/2	25	25	50
7.	HSMC/4-T	Fundamental of Management for Engineers	3/3	-	-	3/3	30	70	100
8.	*AUC/1-T	Indian Constitution	3/-	-	-	3/-	50	-	50
		Total	21/18		8/4	29/22	250	400	650

***It is a non-credit qualifying course only. The assessment will be completely internal.**

SEMESTER-IV

Sr. No.	Course Codes	Nomenclature of the Courses	Workload/Credits				Marks		
			L	T	P	Total	Internal	External	Marks
1.	PC/CSEAIML/8-T	Discrete Mathematical Structures	3/3	-	-	3/3	30	70	100
2.	PC/CSEAIML/9-T	Python Programming for Machine Learning	3/3	-	-	3/3	30	70	100
3.	PC/CSEAIML/10-T	Data Mining Techniques	3/3	-	-	3/3	30	70	100
4.	PC/CSEAIML/11-T	Computer Networks	3/3	-	-	3/3	30	70	100
5.	PC/CSEAIML/9-P	Lab- Python Programming for Machine Learning	-	-	4/2	4/2	25	25	50
6.	PC/CSEAIML/10-P	Lab- Data Mining	-	-	4/2	4/2	25	25	50
7.	HSMC/5-T	Entrepreneurship Development Management	4/4	-	-	4/4	30	70	100
8.	**AUC/2-T	Environmental Sciences	3/-	-	-	3/-	50	-	50
9.	EEC1	Seminar	2/2	-	-	2/2	50	-	50
		Total	21/18	-	8/4	29/22	300	400	700

****It is a non-credit qualifying course only. The assessment will be completely internal**

Note:

1. Students may go for summer training of 4-6 weeks after 2nd Semester, 4th Semester and 6th Semester. Students will have to complete any two (02) summer trainings out of three (03)
2. Students will submit certificate of training in the beginning of next semester at the end of which training is completed.
3. Internal evaluation of training will be made on the basis of open presentation.

SEMESTER-V

Sr. No.	Course Codes	Nomenclature of the Courses	Workload/Credits				Marks		
			L	T	P	Total	Internal	External	Marks
1.	PC/CSEAIML/12-T	Introduction to Machine Learning	3/3	-	-	3/3	30	70	100
2.	PC/CSEAIML/13-T	Theory of Computation	3/3	-	-	3/3	30	70	100
3.	PC/CSEAIML/14-T	Android Application Development	3/3	-	-	3/3	30	70	100
4.	PC/CSEAIML/12-P	Lab- Machine Learning with Python Programming	-	-	4/2	4/2	25	25	50
5.	PC/CSEAIML/14-P	Lab- Android Development	-	-	4/2	4/2	25	25	50
6.	HSMC/6-T	Company Law	4/4	-	-	4/4	30	70	100
7.	OEC1	Open Elective Course (to be opted from other Department)	3/3	-	-	3/3	30	70	100
8.	EEC2	Seminar	2/2	-	-	2/2	50	-	50
		Total	18/18		8/4	26/22	250	400	650

SEMESTER-VI

Sr. No.	Course Codes	Nomenclature of the Courses	Workload/Credits				Marks		
			L	T	P	Total	Internal	External	Marks
1.	PC/CSEAIML/15-T	Software Engineering	3/3	-	-	3/3	30	70	100
2.	PC/CSEAIML/16-T	Cryptography and Network Security	3/3	-	-	3/3	30	70	100
3.	PC/CSEAIML/17-T	Compiler Design	3/3	-	-	3/3	30	70	100
4.	PC/CSEAIML/18-T	Deep Learning	3/3	-	-	3/3	30	70	100
5.	PC/CSEAIML/18-P	Lab- Deep Learning	-	-	4/2	4/2	25	25	50
6.	OEC2	Open Elective (to be opted from other Department)	4/4	-	-	4/4	30	70	100
		Total	16/16		4/2	20/18	175	375	550

Note:

1. Students may go for summer training of 4-6 weeks after 2nd Semester, 4th Semester and 6th Semester. Students will have to complete any two (02) summer trainings out of three (03)
2. Students will submit certificate of training in the beginning of next semester at the end of which training is completed.
3. Internal evaluation of training will be made on the basis of open presentation.

SEMESTER
V

PC/CSEAIML/12-T: Introduction to Machine Learning

Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks				Exam Duration	Assessment Methods
				External	Internal				
Program Core	03	03	Lecture	70	30			3 Hours	TEE/MTE/ Assignment/ Attendance
					20	5	5		

Instructions to paper setter for Final-Term Examination: The Final-Term examination shall cover the whole content of the course. The total number of questions shall be nine. Question number one will be compulsory and will be consisting of short/objective-type questions from the complete syllabus. In addition to the compulsory first question, there shall be four units in the question paper each consisting of two questions. The student will attempt one question from each unit in addition to the compulsory question. All questions will carry equal marks.

Course Objectives: The objective of this course is to make the students familiar with the topics of networking, data communication, modes of transmission, communication media, routing, error control and congestion control.

Course Outcomes	At the end of this course, the student will be able to:
CO1	define: the terms of machine learning: types of machine learning, data preprocessing, classification, regression, and neurons.
CO2	explain: learning types, data preprocessing and architecture of ANN.
CO3	apply: training and testing data using data pre processing and model selection techniques and classification, regression, clustering techniques according to their problem.
CO4	Classify: data preprocessing, model selection, regression, classification, and unsupervised learning techniques.
CO5	compare: Data Preprocessing techniques, Supervised and unsupervised learning.
CO6	Design: predictive model using python programming

CO-PO Mapping Matrix for Course PC/CSEAIML/12-T

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	-	3	1	-	2	-	-
CO2	2	1	1	3	1	-	3	2	-	2	-	-
CO3	3	1	1	3	3	-	3	3	-	2	-	-
CO4	2	1	1	3	1	-	3	3	-	2	-	-
CO5	2	1	3	1	3	-	3	3	-	2	-	-
CO6	2	1	3	1	3	-	3	3	-	2	-	-
Average	2	1.4	1.4	2.2	1.8	-	3	2.4	-	2	-	-

Course Content

PC/CSEAIML/12-T: Introduction to Machine Learning	
Unit I	Basics of Machine Learning: Introduction to artificial Intelligence and machine learning, types of machine learning and its comparisons, applications of machine learning, issues in machine learning. Artificial Neural Network: Introduction, architecture of artificial neural network, activation function.
Unit II	Data Processing: data cleaning, dimensionality reduction, handling missing values. Linear Regression: introduction to supervised learning, linear regression model, model diagnostics (r-squared, ANOVA in linear regression, residual analysis, Coefficient of correlation), multiple linear regression, feature encoding, multi-collinearity handling, residual analysis for multiple linear regression.
Unit III	Classification Problems: classification overview, feature encoding, classification models (using logistic regression, random forest, support vector machine, decision tree), confusion matrix. Unsupervised Learning: Introduction and its applications, techniques in unsupervised learning (clustering, K-means).
Unit IV	Forecasting: overview, moving average, decomposing time series, ARMA model, ARIMA model. Recommender systems: introduction, association rules (metrics, apply association rule), collaborative filtering (user-based similarities, item - based similarities).

Recommended Books

1. Manaranjan Pradhan, U Dinesh Kumar, Machine Learning using Python, WILEY ed. 2019.
2. Anuradha Srinivasaraghavan, Vincy Joseph, Machine Learning, WILEY ed. 2019.
3. Stephen Marsland, Machine Learning: An Algorithmic Perspective, CRC Press.
4. Peter Flach, Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Cambridge University Press.
5. Peter Harrington, Machine Learning in Action, Manning
6. ShaiShalevShwartz and Shai Ben David, Understanding Machine Learning From Theory to Algorithms, Cambridge University Press

PC/CSEAIML/13-T: Theory of Computation							
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
Program Core	03	03	Lecture	70	30 (20 / 5 / 5)	3 Hours	TEE/MTE/ Assignment/ Attendance

Instructions to paper setter for Final-Term Examination: The Final-Term examination shall cover the whole content of the course. The total number of questions shall be nine. Question number one will be compulsory and will be consisting of short/objective-type questions from the complete syllabus. In addition to the compulsory first question, there shall be four units in the question paper each consisting of two questions. The student will attempt one question from each unit in addition to the compulsory question. All questions will carry equal marks.

Course Objectives: to understand fundamental concepts of finite automata, regular grammar, mealy and Moore machine, context free language and grammar their properties, context free language and grammar.

Course Outcomes	By the end of this course, the student will be able to
CO1	define: fundamental concept of finite automata, pushdown automata, Linear bound automata, Turing machine,context free language & grammar, context sensitive language & grammar.
CO2	discuss: concept of context free language and grammar, pushdown automata, equivalence of deterministic and non-deterministic finite automata, ambiguity in grammars and languages, concept of Turing machine.
CO3	use: Pumping lemma to check language is not regular, pushdown automata to check context free language, Turing machine to solve basic calculation.
CO4	classify: finite automata, regular grammar, context free grammar, context free language, context sensitive grammar, normal forms, pushdown automata, Turing machine.
CO5	Compare and contrast: NFA & DFA, mealy and Moore machine, CNF& GNF, languages, grammars, different automata's, Turing machine.

CO-PO Mapping Matrix for Course PC/CSEAIML/13-T

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	-	3	-	-	-	-	-
CO2	2	1	1	3	1	-	3	-	-	-	-	-
CO3	3	1	1	3	3	-	3	-	-	-	-	-
CO4	2	1	1	3	1	-	3	-	-	-	-	-
CO5	2	1	3	1	3	-	3	-	-	-	-	-
Average	2	1.4	1.4	2.2	1.8	-	3	-	-	-	-	-

Course Content

PC/CSEAIML/13-T: Theory of Computation	
Unit I	Finite Automata: Deterministic and non-deterministic finite automata, applications of finite automata, equivalence of deterministic and non-deterministic finite automata, state minimization of DFA, Kleen's characterization theory for sets accepted by finite automata, regular grammar, mealy and Moore machine.
Unit II	Context Free Language and Grammar: Context free grammar, parse tree, application of context free grammars, ambiguity in grammars and languages. Pushdown Automata: Deterministic pushdown automata and non-deterministic pushdown automata, language of pushdown automata, equivalence of PDA's and CFG's.
Unit III	Properties of Context-Free Languages: Normal form of context free grammars, pumping lemma for context-free grammars, closure properties of context-free languages, decision properties of context free languages. Context Sensitive Language and Grammar: Introduction, closure properties of CSL.
Unit IV	Turing machine: Construction of Turing machine, programming techniques for Turing machine, extensions to the basic Turing machine (multi-tape Turing machine, equivalence of one-tape and multi-tape Turing machine, Non-Deterministic Turing machine), restricted Turing machine (multi-stack machines, counter machines).

Recommended Books

1. John C. Martin, Introduction to Languages and the Theory of Computation, McGraw Hill.
2. Peter Linz, An introduction to formal language & automata, Jones & Bartlett publications.
3. Hopcroft J. E. & Ullman J. D, Formal languages and their relation to Automata, Pearson Education.
4. Lewis, H.R. &Papadimitrious, C. H., Elements of the theory of computation, PHI Learning.
5. Michael Sipser, Introduction to the Theory of Computation, Cengage Learning.

PC/CSEAIML/14-T: Android Software Development								
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks			Exam Duration	Assessment Methods
				External	Internal			
Program Core	03	03	Lecture	70	30		3 Hours	TEE/MTE/ Assignment/ Attendance
					20	5 5		

Instructions to paper setter for Final-Term Examination: The Final-Term examination shall cover the whole content of the course. The total number of questions shall be nine. Question number one will be compulsory and will be consisting of short/objective-type questions from the complete syllabus. In addition to the compulsory first question, there shall be four units in the question paper each consisting of two questions. The student will attempt one question from each unit in addition to the compulsory question. All questions will carry equal marks.

Course Objectives: The objective of this course is to provide in-depth coverage of various concepts of android application development.

Course Outcomes	At the end of this course, the student will able to:
CO1	define: android, features, development environment, architecture, software development platform and the framework related to android applications.
CO2	explain: versions of android, architecture, software development platform,
CO3	demonstrate: android SDK, IDE, AVDs, project configuration settings, directory structure of android project, activities and services of android.
CO4	illustrate: android versions, features, system requirements, applications, directory structures,
CO5	compare and contrast: android versions with their functions, types of android applications, development platforms, layout of android applications, activities associated with android and user interfaces.
CO6	create: android applications using different types of resources and development platforms.

CO-PO Mapping Matrix for Course PC/CSEAIML/14-T

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	-	3	2	1	-	2	-
CO2	2	1	1	3	1	-	3	2	1	-	2	-
CO3	3	1	1	3	3	-	3	2	1	-	2	-
CO4	2	1	1	3	1	-	3	2	1	-	2	-
CO5	2	1	3	1	3	-	3	2	1	-	2	-
CO6	3	3	3	1	3	-	3	2	1	-	2	-
Average	2	1.4	1.4	2.2	1.8	-	3	2	1	-	2	-

Course Content

PC/CSEAIML/14-T: Android Software Development	
Unit I	Introduction: Android, Android versions and its feature, The Android market application store. Android Development Environment: system requirements, Android SDK, installing Java, and ADT bundle, eclipse integrated development environment (IDE), creating Android Virtual Devices (AVDs).
Unit II	Android Architecture Overview, creating a new Android project, defining the project name and SDK settings, project configuration settings, configuring the launcher icon, creating an activity, running the application in the AVD, stopping a running application, modifying the example application, reviewing the layout and resource files.
UnitIII	Android software development platform, understanding Java SE and the Dalvik Virtual Machine, the directory structure of an Android project, common default resources folders, screen sizes, launching your application.
UnitIV	Android Framework overview, Android application components, Android activities: defining the UI, Android services: processing in the background, Android Manifest XML: declaring your components, understanding Android views, view groups and layouts, Graphical User Interface screen with views, displaying pictures, files, content providers, and databases.
Recommended Books	
1. Burton Michael, Android App Development for Dummies, Wiley, 2015. 2. Wei-Meng Lee, Beginning Android 4 Application Development, Wiley 3. India (Wrox), 2013. 4. John Horton, Android Programming for Beginners, Packet Publishing, 2015. 5. Ian F. Darwin, Android CookbookProblems and Solutions for Android Developers, 2e, O′Reilly,2017.	

PC/CSEAIML/12-P: Soft Lab – Machine Learning with Python Programming							
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
Program Core	02	04	Practical	25	25	3 Hours	TEE/MTE/ Assignment/ Attendance

Instructions to paper setter for Final-Term Examination: The Final-Term examination will be conducted by a panel of internal and external examiners. Examinees will be evaluated on the basis of practical file, performance in practical exam and a viva voce exam.

Course Objectives: The objective of this course is to make the students familiar with the topics of python programming for machine learning, predictive models, supervised learning. Unsupervised learning.

Course Outcomes	At the end of this course, the student will able to:
CO1	define: the terms of machine learning: types of machine learning, data preprocessing, classification, regression, and neurons.
CO2	explain: learning types, data preprocessing and architecture of ANN.
CO3	apply: training and testing data using data preprocessing and model selection techniques and classification, regression, clustering techniques according to their problem.
CO4	Classify: data preprocessing, model selection, regression, classification, and unsupervised learning techniques.
CO5	compare: Data Preprocessing techniques, Supervised and unsupervised learning.
CO6	create: machine learning applications using different types of resources and development platforms.

CO-PO Mapping Matrix for Course PC/CSEAIML/12-P

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	-	3	2	1	-	2	-
CO2	2	1	1	3	1	-	3	2	1	-	2	-
CO3	3	1	1	3	3	-	3	2	1	-	2	-
CO4	2	1	1	3	1	-	3	2	1	-	2	-
CO5	2	1	3	1	3	-	3	2	1	-	2	-
CO6	3	3	1	1	3	-	3	2	1	-	2	-
Average	2	1.4	1.4	2.2	1.8	-	3	2	1	-	2	-

PC/CSEAIML/14-P: Soft Lab - Android Software Development							
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
Program Core	02	04	Practical	25	25	3 Hours	TEE/MTE/ Assignment/ Attendance

Instructions to paper setter for Final-Term Examination: The Final-Term examination will be conducted by a panel of internal and external examiners. Examinees will be evaluated based on practical file, performance in practical exam and a viva voce exam.

Course Objectives: The objective of this course is to provide in-depth coverage of various concepts of android application development. This course will help the students in learning to develop and publish their own android applications.

Course Outcomes	At the end of this course, the student will able to:
CO1	define: android, features, development environment, architecture, software development platform
CO2	explain: versions of android, architecture, software development platform, JAVA SE,
CO3	demonstrate: android SDK, IDE, AVDs, project configuration settings, directory structure of android project, activities and services of android.
CO4	illustrate: android versions, features, system requirements, applications, directory structures, resource folders, android services, screen sizes and android framework.
CO5	compare and contrast: android versions with their functions, types of android applications, development platforms, layout of android applications, activities associated with android and user interfaces.
CO6	create: android applications using different types of resources and development platforms.

CO-PO Mapping Matrix for Course PC/CSEAIML/14-P

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	-	3	2	1	-	2	-
CO2	2	1	1	3	1	-	3	2	1	-	2	-
CO3	3	1	1	3	3	-	3	2	1	-	2	-
CO4	2	1	1	3	1	-	3	2	1	-	2	-
CO5	2	1	3	1	3	-	3	2	1	-	2	-
CO6	3	3	1	3	3	-	2	1	1	-	2	-
Average	2	1.4	1.4	2.2	1.8	-	3	2	1	-	2	-

HSMC/6-T: Company Law								
Course Type	Course Credit	Contact Hours/Week	Delivery Mode	Maximum Marks			Exam Duration	Assessment Methods
				External	Internal			
Humanities and Social Sciences including Management	04	04	Lecture	70	30		3 Hours	TEE/MTE/ Assignment / Attendance
					20	5 5		

Instructions to paper setter for Final-Term Examination: Final-Term examination shall cover the whole content of the course. Total number of questions shall be nine. Question number one will be compulsory and will be consisting of short/objective type questions from complete syllabus. In addition to compulsory first question there shall be four units in the question paper each consisting of two questions. Student will attempt one question from each unit in addition to compulsory question. All questions will carry equal marks.

Course Objectives: The course aims to develop and comprehend business and its processes in accordance with the provisions of the Companies Act, 2013 while analysing case laws.

Course Outcomes	At the end of this course, the student will be able to:
CO1	Analyse the regulatory aspects and the broader procedural aspects involved in different types of companies covering the Companies Act, 2013 and Rules.
CO2	Prepare the basic legal documents required for formation of a company.
CO3	Analyse the process and documents required for raising capital for the company.
CO4	Analyse the managerial composition of companies and examine the process of company meetings.
CO5	Evaluate the framework of dividend distribution and develop understanding of the winding up process including Insolvency Resolution.

CO-PO Mapping Matrix for Course HSMC/6-T

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	1	-	-	-	-	-	-	-
CO2	2	2	-	-	2	-	-	-	-	-	-	-
CO3	2	2	-	-	3	-	-	-	-	-	-	-
CO4	2	2	-	-	3	-	-		-	-	-	-
CO5	2	3	-	2	3	-	-	-	-	-	-	-
Average	2	1.4	1.4	2.2	1.5	-	3	-	-	2	-	-

Course Content HSMC/6-T: Company Law	
Unit I	History of Company Law in India and England, Nature Definition and characteristics of Company, Lifting of the corporate Veil, Kinds of Companies, Formation and incorporation of a Company, Promoter-status, position, function and remuneration
Unit II	Memorandum of association, its alteration, Doctrine of Ultravires, Article of Association, binding force, alteration, its relationship with memorandum of association, Doctrine of Constructive notice, Doctrine of Indoor management and its exceptions, Meeting: meaning, kinds, resolutions, quorum, and voting
Unit III	Directors: position, appointment, qualifications, vacation of office, Removal, Resignation, Powers and duties of Directors, remuneration of directors, Role of nominee directors, Compensation for loss of Office, Managing Director and other managerial personnel, Secretary: definition, qualification, position, appointment duties and qualities. Share: its kind, different aspects, Debentures and its kind, different aspects
Unit IV	Majority rules and minority protection, Prevention of Oppression and mismanagement. Winding up: types, grounds, who can apply, procedure, Powers of Liquidator, consequences of winding up order, Members and Creditors winding up, Liability of past members-payment of liabilities, Preferential payment, Winding up of unregistered company, Receiver, power, appointment, duties and liabilities.
Recommended Books	
1. Taxmann's(A.K Majumdor, Dr. G.K. Kapoor, Company Law and Practice 2. L.C.B Gower, Priciples of Modern Company Law 3. Dr. Avtar Singh, Indian Company Law 4. Dr. N.D. Kapoor, Company Law 5. A. Ramayya, A Guide to Companies Act	

EEC2: Seminar							
Course Type	Course Credit	Contact Hours/Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
Employment Enhancement Courses	02	02	Presentation	--	50	1 Hours	Report Writing / Presentation

Instructions: Evaluation is based on work done, quality of report, performance in viva-voce, presentation etc

Course Objectives: This is a mandatory course to enhance the knowledge, skills and attitude of the graduating engineers to the environment. By studying this course students will understand our natural environment and its relationship with human activities.

SEMESTER VI

PC/CSEAIML/15-T: Software Engineering								
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks			Exam Duration	Assessment Methods
				External	Internal			
Program Core	03	03	Lecture	70	30		3 Hours	TEE/MTE/ Assignment/ Attendance
					20	5 5		

Instructions to paper setter for Final-Term Examination: The Final-Term examination shall cover the whole content of the course. The total number of questions shall be nine. Question number one will be compulsory and will be consisting of short/objective-type questions from the complete syllabus. In addition to the compulsory first question, there shall be four units in the question paper each consisting of two questions. The student will attempt one question from each unit in addition to the compulsory question. All questions will carry equal marks.

Course Objectives: The objective of this course is to make the students familiar with the topics of software crisis, software engineering paradigms, software configuration management, design, coding, testing and maintenance.

Course Outcomes	At the end of this course, the student will be able to:
CO1	enumerate/define the concepts of: software and software engineering, software development paradigms,
CO2	describe and summarize: phases of software development process, testing techniques, relationship between reliability and quality.
CO3	illustrate various techniques of: requirement analysis, design, coding, testing and maintenance, quality and reliability.
CO4	analyze and classify: software engineering paradigms, cost estimation models, design methodologies, testing techniques, maintenance process, reliability and quality models.
CO5	compare and select from amongst candidate: software engineering paradigms, cost estimation models,

CO-PO Mapping Matrix for Course PC/CSEAIML/15-T

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	-	3	2	1	-	2	-
CO2	2	1	1	3	1	-	3	2	1	-	2	-
CO3	3	1	1	3	3	-	3	2	1	-	2	-
CO4	2	1	1	3	1	-	3	2	1	-	2	-
CO5	2	1	3	1	3	-	3	2	1	-	2	-
Average	2	1.4	1.4	2.2	1.8	-	3	2	1	-	2	-

Course Content PC/CSEAIML/15-T: Software Engineering	
Unit I	Software and software engineering, software characteristics, software crisis, software engineering paradigms, planning a software project, software cost estimation, project scheduling, personnel planning, team structure.
Unit II	Software requirement analysis: structured analysis, object-oriented analysis and data modelling, software requirement specification, validation. Software configuration management, quality assurance, project monitoring, risk management.
Unit III	Design and implementation of software: software design fundamentals, structured design methodology and object-oriented design, design verification, monitoring and control, coding. Software Reliability: metric and specification, fault avoidance and tolerance, exception handling, defensive programming.
UnitIV	Testing: testing fundamentals, white box and black box testing, software testing strategies: unit testing, integration testing, validation testing, system testing, debugging. Software maintenance: maintenance characteristics, maintainability, maintenance tasks, maintenance side effects. CASE tools. agile development.
Recommended Books	
1. Mall, Rajib, Fundamentals of Software Engineering, PHI Learning Pvt. Ltd 2. Aggarwal, K.K, and Singh, Yogesh, Software Engineering, New Age International 3. Jalote, Pankaj, An Integrated Approach to Software Engineering, Narosa Publishing House. 4. Pressman, S. Roger, Software Engineering, Tata McGraw-Hill.	

PC/CSEAIML/16-T: Cryptography and Network Security								
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks			Exam Duration	Assessment Methods
				External	Internal			
Program Core	03	03	Lecture	70	30		3 Hours	TEE/MTE/ Assignment/ Attendance
					20	5 5		

Instructions to paper setter for Final-Term Examination: The Final-Term examination shall cover the whole content of the course. The total number of questions shall be nine. Question number one will be compulsory and will be consisting of short/objective-type questions from the complete syllabus. In addition to the compulsory first question, there shall be four units in the question paper each consisting of two questions. The student will attempt one question from each unit in addition to the compulsory question. All questions will carry equal marks.

Course Objectives: The aim of this course is to introduce the student to the areas of cryptography and cryptanalysis. This course develops a basic understanding of the algorithms used to protect users online and to understand some of the design choices behind these algorithms.

Course Outcomes	At the end of this course, the student will be able to:
CO1	describe various cryptography terminology and cryptographic Algorithms.
CO2	represent security in terms of various techniques and algorithms. (
CO3	apply mathematical techniques to cryptography for solving problems related to security issue.
CO4	identify various types of attacks for their mitigation/proactive and reactive treatment.
CO5	judge the security of an organization/institute by means of network security devices/models/controls.
CO6	integrate different types of securities under one environment and evaluate its performance

CO-PO Mapping Matrix for Course PC/CSEAIML/16-T

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	-	3	2	1	-	2	-
CO2	2	1	1	3	1	-	3	2	1	-	2	-
CO3	3	1	1	3	3	-	3	2	1	-	2	-
CO4	2	1	1	3	1	-	3	2	1	-	2	-
CO5	2	1	3	1	3	-	3	2	1	-	2	-
Average	2	1.4	1.4	2.2	1.8	-	3	2	1	-	2	-

PC/CSEAIML/16-T: Cryptography and Network Security	
Unit I	Computer & Network Security Concepts; Security Goals; Threats, Attacks, & Assets; Vulnerabilities; Security Functional Requirements; Security Services; Security Mechanism; Secure Communications; Model for Network Security; The OSI Security Architecture; Symmetric and Asymmetric Key Ciphers; Classical Encryption Techniques; Symmetric Ciphers: Confidentiality with Symmetric Encryption; One-Time Pads; User Authentication Methods; Block Cipher and Data Encryption Standard; Advanced Encryption Standard; RC2, RC4, RC5 & RC6; Block Cipher Operation; Random and Pseudo Random Numbers.
Unit II	Asymmetric Ciphers: Public Key Cryptography and RSA; Diffie-Hellman Key Exchange; Elliptic Curve Cryptography. Cryptographic Data integrity: Cryptographic Hash Functions and Applications; Message Authentication Codes; Digital signatures & Schemes; Hashing & Signing; Message Digests; Digital Signature Standard; Birthday attacks on Signatures. Key Management and Distribution: Symmetric Key Distribution using Symmetric Encryption & Asymmetric Encryption; Distribution of Public Keys; X.509 Certificates; Public Key Infrastructure.
Unit III	User Authentication Protocols:Principles; Remote User Authentication using Symmetric & Asymmetric Encryption; Kerberos. Network Security: Threats & Attacks; Denial-of Service; Cryptography in Network Security: Network & Browser Encryption, Onion Routing, IP Security protocol Suite (IPSec), Virtual Private Networks; Firewalls: Design & Types, Personal Firewalls, Network Address Translation (NAT); Intrusion Detection and Prevention Systems. IP Security: Overview; IP Security Policy; Encapsulating Security Payload; Combining;Internet Key Exchange.
UnitIV	Transport-Level Security: Web Security: Issues & Threats; Secure Naming; Secure Socket layer (SSL); Transport Layer Security (TLS); HTTPS; Secure Shell(SSH). Wireless Network Security: Vulnerabilities in Wireless Networks; IEEE 802.11 Wireless LAN Securities; Wireless Application Protocol Overview; Wireless Transport Layer Security; WEP & WPA. Electronic-mail Security: E-Mail Attacks; Pretty Good Privacy (PGP); Privacy Enhanced Mail (PEM); S/MIME; DomainKeys Identified Mail (DKIM).
Recommended Books	
1. William Stallings, Cryptography and Network security-Principles and Practices, Pearson Education, Ninth Indian Reprint 2005. 2. Charlie Kaufman , Network Security : Private communication in Public World, Prentice-Hall International, Inc. April 2008. 3. Roberta Bragg, Mark Rhodes-Ousley, Keith Strassberg, The Complete Reference Network Security, McGraw hill Education, 2004. 4. Charles P. Fleeger, Security in Computing, 2nd Edition, Prentice Hall International Inc., 1996. 5. Atul Kahate, Cryptography and Network Security, McGraw Hill Education; Third edition, 2017	

PC/CSEAIML/17-T: Complier Design								
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks			Exam Duration	Assessment Methods
				External	Internal			
Program Core	03	03	Lecture	70	30		3 Hours	TEE/MTE/ Assignment/ Attendance
					20	5 5		

Instructions to paper setter for Final-Term Examination: The Final-Term examination shall cover the whole content of the course. The total number of questions shall be nine. Question number one will be compulsory and will be consisting of short/objective-type questions from the complete syllabus. In addition to the compulsory first question, there shall be four units in the question paper each consisting of two questions. The student will attempt one question from each unit in addition to the compulsory question. All questions will carry equal marks.

Course Objectives: Compilers have become part and parcel of today‘s computer systems. These are responsible for making the user‘s computing requirements, specified as a piece of program, understandable to the underlying machine. There tools work as interface between the entities of two different domains – the human being and the machine. The actual process involved in this transformation is quite complex. Compiler design covers basic translation mechanism and, error detection and recovery.

Course Outcomes	At the end of this course, the student will be able to:
CO1	state principles of compiler design.
CO2	illustrate the essential phases for automatically converting source code into object code.
CO3	apply lexical analysis, syntax analysis and code optimization techniques for solving problems.
CO4	analyse a parse tree and a givenBNF grammar.
CO5	compare and contrast syntax-oriented translation schemes
CO6	design a lexical analyser from the specification of alanguage's lexical rules.

CO-PO Mapping Matrix for Course PC/CSEAIML/17-T

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	-	3	2	1	-	2	-
CO2	2	1	1	3	1	-	3	2	1	-	2	-
CO3	3	1	1	3	3	-	3	2	1	-	2	-
CO4	2	1	1	3	1	-	3	2	1	-	2	-
CO5	2	1	3	1	3	-	3	2	1	-	2	-
Average	2	1.4	1.4	2.2	1.8	-	3	2	1	-	2	-

PC/CSEAIML/17-T: Compiler Design	
Unit I	Introduction To Compilers: Compilers and translators, need of translators, structure of compiler its different phases, Compiler construction tools. Lexical Analysis: Role of lexical analyzer, design of lexical analyzer, regular expressions, Specification and recognition of tokens, input buffering, A language specifying lexical analyzer. Finite automata, conversion from regular expression to finite automata, and vice versa, minimizing number of states of DFA, Implementation of lexical analyzer.
Unit II	Syntax Analysis: Role of parsers, context free grammars, definition of parsing. Parsing Technique: Shift- reduce parsing, operator precedence parsing, top-down parsing, predictive parsing.
Unit III	LR parsers, SLR, LALR and Canonical LR parser. Syntax Directed Translations: Syntax directed definition, construction of syntax trees, syntax directed translation scheme, implementation of syntax directed translation, three address code, quadruples and triples.
UnitIV	Symbol Table & Error Detection and Recovery: Symbol tables, its contents and data structure for symbol tables; trees, arrays, linked lists, hash tables. Errors, lexical phase error, syntactic phase error, semantic error. Code Optimization & Code Generation: Code generation, forms of objects code, machine dependent code, optimization, register allocation for temporary and user defined variables.
Recommended Books	
1. Alfread V. AHO, Ravi Sethiand J.D. Ullman, Compilers Principle, Techniques and Tools, Addison Wesley, 2007. 2. Tremblay and Sorenson, Theory and practice of compiler writing, Mc. Graw Hill, 1985. 3. Dhamdare, System software, MGH, 1986. 4. Alfred V. Aho, Jeffrey D. Ullman, Principles of Compiler Design, Narosa Publication, 2002.	

PC/CSEAIML/18-T: Deep Learning								
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks			Exam Duration	Assessment Methods
				External	Internal			
Program Core	03	03	Lecture	70	30		3 Hours	TEE/MTE/ Assignment/ Attendance
					20	5 5		

Instructions to paper setter for Final-Term Examination: The Final-Term examination shall cover the whole content of the course. The total number of questions shall be nine. Question number one will be compulsory and will be consisting of short/objective-type questions from the complete syllabus. In addition to the compulsory first question, there shall be four units in the question paper each consisting of two questions. The student will attempt one question from each unit in addition to the compulsory question. All questions will carry equal marks.

Course Objectives:A typical course objective in Deep Learning aims to equip students with the theoretical knowledge and practical skills to understand, design, implement, and apply deep learning techniques to solve real-world problem.

Course Outcomes	At the end of this course, the student will be able to:
CO1	define: the terms of machine learning: deep learning, regression, classification, regression, neurons, CNN and RNN.
CO2	explain: architecture of ANN and deep learning, variants of the basic convolution function, Long short-term memory.
CO3	apply: classification, regression, clustering techniques, Feed forward multilayer neural network, CNN, RNN according to their problem.
CO4	Classify: regression, classification, Convolutional Neural networks, RNN
CO5	compare: Single-layer and Multi-layer Perceptron, CNN and RNN

CO-PO Mapping Matrix for Course PC/CSEAIML/18-T

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	-	3	2	1	-	2	-
CO2	2	1	1	3	1	-	3	2	1	-	2	-
CO3	3	1	1	3	3	-	3	2	1	-	2	-
CO4	2	1	1	3	1	-	3	2	1	-	2	-
CO5	2	1	3	1	3	-	3	2	1	-	2	-
Average	2	1.4	1.4	2.2	1.8	-	3	2	1	-	2	-

PC/CSEAIML/18-T: Neural Network	
Unit I	**Introduction:** Introduction to Machine learning, Deep learning and AI , Historical trends in Deep learning,Architecture of deep learning, Significance of Deep learning, application of deep learning, challenges of Deep learning. **Neural Network**: Introduction, architecture, difference between Biological Neuron Network and Artificial Neuron Network
Unit II	**Foundation of Deep Learning:** Vector, scalars, matrix, statistics, probability. Regression, classification, underfitting, overfitting, gradient descent, logistic regression, confusion matrix. Activation functions of Neural Network (liner, sigmoid, tanh, softmax).
Unit III	**Fundamental of Deep Learning:** common architectural principles of deep learning, Single-layer and Multi-layer Perceptron, Cross-entropy loss functions for Neural net, Matrix representation of Neural nets. **Building block of deep network**: Feed forward multilayer neural network, RBMs, Autoencoders.
UnitIV	**Convolutional Neural networks:** Deep Learning and Neural Networks Perceptrons, Convolutional networks, variants of the basic convolution function, efficient convolution algorithms. **Recurrent Neural networks:** Bidirectional RNNs, Deep recurrent networks, recursive neural networks, The Long short-term memory and other gated RNNs.
Recommended Books	
1. David Foster, Generative Deep Learning, O'Reilly, 2019. 2. Goodfellow, Y. Bengio, A. Courville, Deep Learning, MIT Press, 2016. 2. Patterson, Josh, and Adam Gibson. Deep learning: A practitioner's approach. " O'Reilly Media, Inc.", 2017. 3. Charu, C. Aggarwal. Neural networks and deep learning: a textbook. 2018. 4. Buduma, Nithin, Nikhil Buduma, and Joe Papa. Fundamentals of deep learning. " O'Reilly Media, Inc.", 2022. 5. Weidman, Seth. Deep learning from scratch: building with python from first principles. O'Reilly Media, 2019. 6. Ian Goodfellow, YoshuaBengio and Aaron Courville. Deep learning, The MIT Press, 2016.	

PC/CSEAIML/18-P: Deep Learning								
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks			Exam Duration	Assessment Methods
				External	Internal			
Program Core	03	03	Lecture	70	30		3 Hours	TEE/MTE/ Assignment/ Attendance
					20	5 5		

Instructions to paper setter for Final-Term Examination: The Final-Term examination shall cover the whole content of the course. The total number of questions shall be nine. Question number one will be compulsory and will be consisting of short/objective-type questions from the complete syllabus. In addition to the compulsory first question, there shall be four units in the question paper each consisting of two questions. The student will attempt one question from each unit in addition to the compulsory question. All questions will carry equal marks.

Course Objectives:

Course Outcomes	At the end of this course, the student will be able to:
CO1	define: the terms of machine learning: deep learning, regression, classification, regression, neurons, CNN and RNN.
CO2	explain: architecture of ANN and deep learning, variants of the basic convolution function, Long short-term memory.
CO3	apply: classification, regression, clustering techniques, Feed forward multilayer neural network, CNN, RNN according to their problem.
CO4	Classify: regression, classification, Convolutional Neural networks, RNN
CO5	compare: Single-layer and Multi-layer Perceptron, CNN and RNN

CO-PO Mapping Matrix for Course PC/CSEAIML/18-P

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	-	3	2	1	-	2	-
CO2	2	1	1	3	1	-	3	2	1	-	2	-
CO3	3	1	1	3	3	-	3	2	1	-	2	-
CO4	2	1	1	3	1	-	3	2	1	-	2	-
CO5	2	1	3	1	3	-	3	2	1	-	2	-
Average	2	1.4	1.4	2.2	1.8	-	3	2	1	-	2	-