Learning Outcomes based Curriculum Framework
(LOCF)

For Committee

Bachelor of Technology
Computer Science & Engineering
(Artificial Intelligence & Machine Learning)
Four-Year Graduate Programme

Curriculum for 2nd Year onwards
For 2023-24 Batch onwards

Staff council

Board of studies

Department of Computer Science & Engineering
Faculty of Engineering and Technology
Chaudhary Devi Lal University
Sirsa-125055

FET

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]

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SEMESTER-III

Sr. No.	Course Codes	Nomenclature of the Courses	Workload/Credit				Marks		
			L	T	P	Total	Internal	External	Total
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

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

SEMESTER-V

Sr. No.	Course Codes	Nomenclature of the Courses	Workload/Credit				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	Software Engineering	3/3	-	-	3/3	30	70	100
4.	PC/CSEAIML/15-T	Android Application Development	3/3	-	-	3/3	30	70	100
5.	PC/CSEAIML/12-P	Lab- Machine Learning	-	-	4/2	4/2	25	25	50
6.	PC/CSEAIML/15-P	Lab- Android Development	-	-	4/2	4/2	25	25	50
7.	HSMC/6-T	Company Law	4/4	-	-	4/4	30	70	100
8.	OEC1	Open Elective Course	3/3	-	-	3/3	-	-	-
9.	EEC2	Seminar	2/2	-	-	2/2	50	-	50
		Total	21/21		8/4	29/25	250	450	650

SEMESTER-VI

Sr. No.	Course Codes	Nomenclature of the Courses	Workload/Credits				Marks		
			L	T	P	Total	Internal	External	Total
1.	EEC3	Industry/Research Lab/Internship	-	-	-	18/18	100	350	450
Internship Option			-	-	-	18/18			
• Within India or Abroad (Any other aligned with GOI schemes). • To enhance hands-on skills (As per NEP 2020)									

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SEMESTER VII

Sr. No.	Course Codes	Nomenclature of the Courses		Workload/Credits				Marks		
				L	T	P	Total	Internal	External	Total
1.	PC/CSEAIML/16-T	Internet of Things		4/4	-	-	4/4	30	70	100
2.	PE/CSEAIML/1-T	Professional Elective-I		4/4	-	-	4/4	30	70	100
3.	PC/CSEAIML/16-P	Lab- Internet of Things		-	-	4/2	4/2	25	25	50
4.	OEC2	Open Elective Course		3/3	-	-	3/3	-	-	-
5.	EEC4	Project 1	Project Documentation	-	-	2/2	-	-	50	50
			Project Viva	-	-	4/4	-	-	100	100
			Internal Assessment	-	-	2/2	2/2	50	-	50
		Total		11/11	-	12/10	23/21	135	315	450

Note: A 4-6 weeks industrial training/internship is mandatory after the completion of the VIIth semester.

SEMESTER VIII

Sr. No.	Course Codes	Nomenclature of the Courses		Workload/Credits				Marks		
				L	T	P	Total	Internal	External	Total
1.	PE/CSEAIML/2-T	Professional Elective-II		4/4	-	-	4/4	30	70	100
2.	PE/CSEAIML/3-T	Professional Elective-III		4/4	-	-	4/4	30	70	100
3.	PE/CSEAIML/2-P	Lab- Professional Elective-III		-	-	4/2	4/2	25	25	50
4.	OEC2	Open Elective Course		3/3	-	-	3/3	-	-	-
5.	EEC5	Project 1	Project Documentation	-	-	-	-	50	50	
			Project Viva	-	-	-	-	100	100	
			Internal Assessment	-	-	2/2	2/2	50	-	50
		Total		11/11	-	12/10	23/21	135	315	450

Note: A 4-6 weeks industrial training/internship is mandatory after the completion of the VIIIth semester.

List of Electives for VII and VIII Semester

1. Deep Learning
2. Natural Language Processing
3. Embedded System
4. Robotics
5. Quantum Computing
6. Cyber Security

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BSC/3-T : Mathematics-III								
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks			Exam Duration	Assessment Methods
				External	Internal			
Basic Science	04	04	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 Objective: The main aim of the course is to discuss the concepts and related terminology of Numerical Methods, Basis Integration, Sampling Theory and complex number problems.

Course Outcomes	At the end of this course, the student will be able to:
CO1	**Define** concepts and terminology of Numerical Methods;
CO2	**Solve** problems using Numerical Methods, Integration etc.
CO3	**Apply** principles of functions of complex variables to solve computational problems.
CO4	**Compare** various concepts related to Numerical Methods, Integration and complex numbers;
CO5	**Integrate** the knowledge for solving real world problems.

CO-PO Mapping Matrix for Course BSC/3-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	-	-	-	-	-

SC BOS FET

Course Content BSC/3-T : Mathematics-III	
Unit I	Numerical Methods: Algorithms, Convergence, Bisection method, False position method, Newton-Raphson methods, Gauss-Siedel and Gauss-Elimination methods, Lagrange and Newton interpolation, linear and higher order. Numerical differentiation: forward difference, backward difference and Central Difference.
Unit II	Basis Integration, trapezoidal rule, Simpson's rule, Euler's method. Statistics: Sample distributions, Test of Significance, chi-square, t and f test. Analysis of Variance: Definition, Assumptions, One way classification, ANOVA Table, Two-way classification
Unit III	Sampling Theory and Testing Hypothesis: Population and Sample, Random Sampling, Population Parameters, Sample Statistics, Sampling Distributions, Sample Mean, Sample Variance, Tests of Hypothesis and Significance.
Unit IV	Basic of Complex number, De Moivre's theorem, Complex functions, Functions of Complex variable (Exponential, Circular, Logarithmic), Hyperbolic Function, Inverse Hyperbolic Function, Summation of Series. Limit and Continuity of f(z), Geometrical representation of f(z), Cauchy-Riemann Equation, Harmonic function- orthogonal system, Cauchy's theorem. Morera's theorem, Series of Complex term, Taylor's series- Laurent's series
Recommended Books	
1. F. Kreyszig, Advanced Engineering Mathematics, 10th edition, Wiley, 2015. 2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th edition, 1965. 3. R. K. Jain, S.R.K. Iyenger. Advance Engineering. Mathematics, 4th edition, Narosa Publishing House, 2012. 4. Michael D. Greenberg, Advanced Engineering Mathematics, 2nd edition, Pearson Education, 2002. 5. Johnson and Miller Probability and statistics for Engineers, 8th edition, Pearson Education India, 2015.	

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BOS

FET

PC/CSEAIML/5-T: Operating Systems								
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: 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 objective of this course is to help students become familiar with the fundamental concepts of operating systems and provide them with enough understanding of operating system design.

Course Outcomes	At the end of this course, the student will be able to:
CO1	**List** various functions and design characteristics of operating systems.
CO2	**Explain** fundamental concepts of operating systems.
CO3	**Apply** operating system design concepts for solving problems regarding scheduling, memory management, disk management and deadlocks etc.
CO4	**Analyze** the issues related to various operating systems.
CO5	**Design** solutions for the memory and process management problems.

CO-PO Mapping Matrix for Course PC/CSEAIML/5-T

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

S.C. BOS FET

Course Content PC/CSEAIML/5-T: Operating Systems	
Unit I	Introductory Concepts: Operating systems functions and characteristics, operating system services and systems calls, system programs, operating system structure. operating systems generation, Types of Operating systems: Batch operating system, Time-sharing OS, Distributed operating system, Real time systems. File Systems: Types of Files and their access methods, File allocation methods, Directory Systems: Structured Organizations, directory and file protection mechanisms, disk scheduling and its associated algorithms.
Unit II	Processes: Process concept, Process Control Block, Operations on processes, cooperating processes. CPU scheduling: Levels of Scheduling, scheduling criteria, Comparative study of scheduling algorithms, Algorithm evaluation, multiple processor scheduling. Critical-section problem, Semaphores.
Unit III	Storage Management: Storage allocation methods: Single contiguous allocation, non-contiguous memory allocation, Paging and Segmentation techniques, segmentation with paging, Virtual memory concepts, Demand Paging, Page replacement Algorithms, Thrashing.
Unit IV	Deadlock: System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock Case Studies: Comparative study of WINDOW, UNIX & LINUX system.
Recommended Books	
1. Silberschatz, Peter B. Galvin and Greg Gagne, Operating System Concepts, 8th Edition, Wiley Indian Edition, 2010. 2. Andrew S Tanenbaum, Modern Operating Systems, Third Edition, Prentice Hall India, 2008. 3. Naresh Chauhan, Principles of Operating Systems, Oxford Press, 2014. 4. D.M. Dhamdhere, Operating Systems, 2nd edition, Tata McGraw Hill, 2010. 5. William Stallings, Operating Systems– Internals and Design Principles, 5th Edition, Prentice Hall India, 2000.	

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FET

PC/CSEAIML/6-T: Java Programming							
Course Type	Course Credit	Contact Hours/Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
Program Core	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 objective of this course is to help students become familiar with the fundamental concepts of java and provide them with enough understanding of java programming.

Course Outcomes	At the end of this course, the student will be able to:
CO1	outline: programming environment, data types, control constructs, loops, arrays, programming approaches, threads in programming,
CO2	summarize: programming fundamentals, programming approaches, multithreaded programming, data storing using file system, data structure library, GUI concepts.
CO3	apply: basic programming concepts: to solve basic mathematical operations, data structure operations, concurrent execution of threads, user friendly interfaced programs.
CO4	categorize: data types, programming approaches, flow controls constructs, loops, single and multithreaded programming, various classes in collection framework, GUI controls.
CO5	choose: data types, programming approaches, branching and iteration methods, serial or concurrent programming, data structures supporting classes in collection framework.
CO6	create: programs using basic concepts, multithreading and GUI based concepts.

CO-PO Mapping Matrix for Course PC/CSEAIML/6-T

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	-	3	-	-	2	-	-
CO2	2	1	1	3	1	-	3	-	-	2	-	-
CO3	3	1	1	3	3	-	3	-	-	2	-	-
CO4	2	1	1	3	1	-	3	-	-	2	-	-
CO5	2	1	3	1	3	-	3	-	-	2	-	-
CO6	3	3	1	2	1	-	3	-	-	2	-	-
Average	2	1.4	1.4	2.2	1.5	-	3	-	-	2	-	-

S.C. BOS F.E.T.

Course Content PC/CSEAIML/6-T: Java Programming	
Unit I	Java: history, basic concepts, data types, reference types, operators and its types, decision controls, control statements, loops, array, string, functions, scope of variables,
Unit II	OOPS concepts in Java: encapsulation, class, object, constructors, destructors, Polymorphism: compile-time and run-time, inheritance, interface, abstract class, packages, exception handling.
Unit III	Multithreading in Java: thread model, multithreading supporting classes and methods, creating single and multiple threaded programs, context switching, thread synchronization, inter thread communication.
Unit IV	Working with GUI in Java: containers and components. Collection framework in Java: interfaces and classes for collection framework, list, set, map. I/O stream in Java: input and output stream, file handling operations.
Recommended Books	
1. Darrel Ince& Adam Freeman, Programming the Internet with Java, 2e, Addison Wesley. 2. K.A. Mughal, R.W. Rasmussen, A Programmer's Guide to Java Certification, Addison Wesley. 3. E. Balagurusamy, Programming with Java, 6e, Tata McGraw Hill. 4. Herbert Schildt, The Complete Reference Java, 10e, Tata McGraw Hill.	

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PC/CSEAIML/7-T: R for Data Analytics								
Course Type	Course Credit	Contact Hours/Week	Delivery Mode	Maximum Marks			Exam Duration	Assessment Methods
				External	Internal			
Program Core	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: In this course, the learners will be able to develop expertise in R programming for manipulating, exploring, visualizing, applying descriptive and inferential statistics. In addition, they will learn to implement predictive modeling.

Course Outcomes	At the end of this course, the student will be able to:
CO1	Define the basic terms related to data analytics.
CO2	Describe data with statistical summaries and plots.
CO3	Build predictive models
CO4	Analyse the quality of a statistical and machine learning models.
CO5	Interpret and evaluate statistical and predictive models.
CO6	Conclude the findings of predictive modeling.

CO-PO Mapping Matrix for Course PC/CSEAIML/7-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	-	-	-	-	-	-	-
CO6	2	3	-	2	3	-	-	-	-	-	-	-
Average	2	1.4	1.4	2.2	1.5	-	3	-	-	2	-	-

S.C. BOS FET

Course Content PC/CSEAIML/7-T: R for Data Analytics	
Unit I	R for Data analytics preliminaries: Introduction to R for data analytics, scales of measurements (Data types) and their implementation in R. Working with vectors, list, Matrices, Array, Factors and tabular data (data frames), Control statements and Loops: if, if-else, for loops, while, repeat and break. Functions in R: built-in functions for Mathematics, writing user-defined functions in R.
Unit II	Visualizing data through various plots and charts: bar charts, histogram, frequency polygon, density plots, scatter plots, box & whisker plots, heat and contour plots, plotting the above graphs in R. Working with tidyverse (ggplot2, dplyr, tidyr, stringr, tibble, readr, purr) for data visualization, manipulations and transformations.
Unit III	Manipulating tabular data: Sorting, filtering cases, selecting variables, deriving new variables, grouping and summarizing data. Describing data with statistical summaries (mean, median, mode, variance and standard deviation). Discriminating between sample and population Exploratory data analysis: random and normally distributed variables, skewed normal distribution, z-score, detecting outliers in data, handling missing values.
Unit IV	Predictive modeling: what is predictive modeling, estimating a function, the trade-off between model accuracy and prediction accuracy and model interpretability, regression versus classification, measuring the quality of fit, The bias and variance trade- off. Simple and multiple linear regression modeling: estimating the coefficients, assessing the accuracy of the coefficient estimates, assessing the accuracy of the model. Building regression models in R.

Recommended Books

1. W. N. Venables, D. M. Smith and the R core Team, An introduction to R, Notes on R: A Programming Environment for Data Analysis and Graphics, version 3.3.2, 2016.
2. Saroj Dahiya Ratnoo and Himmat Singh Ratnoo, Essentials of R for Data Analytics, Wiley, 2021.
3. Hadley Wickham and Garrett Grolemund, R for Data Science Import, Tidy, Transform and model Data, O'Reilly, 2017.
4. Paul Teeter, R Cookbook, O'Reilly, 2011.
5. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, An Introduction to Statistical Learning with Applications in R, Springer, 2013.
6. Han, J., Kamber, M, Pei, J., Data Mining Concepts and Techniques, Third edition, Morgan Kaufmann, 2012.

S.C. BOS

PC/CSEAIML/6-P: Software Lab –Java							
Course Type	Course Credit	Contact Hours/ Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
Practical	02	04	Lab Work	25	25	3 Hours	TEE/ Practical File

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 the practical file, performance in practical exam and a viva voce exam.

Course Objectives: The objective of this course is to get the students hands-on practice with Core Java programming concepts covered in course **PC/CSEAIML/6-T.**

Course Outcomes	By the end of this course, the student will able to:
CO1	outline: programming environment, data types, control constructs, loops, arrays, programming approaches, threads in programming, file system for data storing, data structure library, graphical user interface concepts.
CO2	summarize: programming fundamentals, programming approaches, multithreaded programming, data storing using file system, data structure library, GUI concepts.
CO3	apply: basic programming concepts: to solve basic mathematical operations, data structure operations, concurrent execution of threads, user friendly interfaced programs.
CO4	categorize: data types, programming approaches, controls constructs, loops, single and multithreaded programming, various classes in collection framework, GUI controls.
CO5	choose: data types, programming approaches, branching and iteration methods, serial or concurrent programming, data structures supporting classes in collection framework.
CO6	develop: programs using basic concepts, multithreading and GUI based concepts.

CO-PO Mapping Matrix for Course PC/CSEAIML/6-P

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	-	3	1	-	-	-	-
CO2	2	1	1	3	1	-	3	2	-	-	-	-
CO3	3	1	1	3	3	-	3	3	-	-	-	-
CO4	3	3	1	3	1	-	3	3	-	-	-	-
CO5	3	1	3	1	3	-	3	3	-	-	-	-
CO6	3	3	3	3	3	-	3	3	-	-	-	-
Average	2.5	2	1.66	2.33	2	-	3	2.5	-	-	-	-

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PC/CSEAIML/7-P: Lab- R for Data Analytics							
Course Type	Course Credit	Contact Hours/Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
Program Core	02	04	Lecture	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 learners will be able to develop expertise in R programming for manipulating, exploring, visualizing, applying descriptive and inferential statistics. In addition, they will learn to implement predictive modeling.

Course Outcomes	At the end of this course, the student will be able to:
CO1	**Define** the basic terms related to data analytics.
CO2	**Describe** data with statistical summaries and plots.
CO3	**Build** predictive models
CO4	**Analyse** the quality of a statistical and machine learning models.
CO5	**Interpret** and evaluate statistical and predictive models.
CO6	**Conclude** the findings of predictive modeling.

CO-PO Mapping Matrix for Course PC/CSEAIML/7-P

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	-	-	-	-	-	-	-
CO6	2	3	-	2	3	-	-	-	-	-	-	-
Average	2	1.4	1.4	2.2	1.5	-	3	-	-	2	-	-

S.C.

BOS

HSMC/4-T: Fundamentals of Management for Engineers								
Course Type	Course Credit	Contact Hours/Week	Delivery Mode	Maximum Marks			Exam Duration	Assessment Methods
				External	Internal			
Humanities and Social Sciences including Management	03	03	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: Fundamentals of Management for Engineers is a necessary course for B. Tech. (CSE) graduates wishing to work with organizations in their near future. It helps them acquiring managerial, planning and decision-making skills. This course makes students ready to work in teams as well as play leadership roles.

Course Outcomes	At the end of this course, the student will be able to:
CO1	**define** fundamental concepts of management
CO2	**explain** the basic principles of management related to planning and decision making, HRM and motivation, and leadership.
CO3	**apply** the managerial skills to solve real world management problems.
CO4	**Analyse** the quality of a statistical and machine learning models.
CO5	**evaluate** a business model based on principles of management.

CO-PO Mapping Matrix for Course HSMC/4-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	-	-

S.C.

BOS

Course Content HSMC/4-T: Fundamentals of Management for Engineers	
Unit I	Management Definition: Scope and process of management, Managerial Roles, Levels of Management, Managerial Skills, Challenges of Management, Evolution of Management, Scientific and Administrative Management, The Behavioural approach, The Quantitative approach, The Systems Approach, Contingency Approach, IT Approach.
Unit II	**Planning and Decision Making**: General Framework for Planning, Planning Process, Types of plans, Management by objectives, Development of business strategy. **Decision making and Problem Solving**: Programmed and Non-Programmed Decisions, Steps in Problem Solving and Decision Making, Bounded Rationality and Influences on Decision Making, Group Problem Solving and Decision Making, Creativity and Innovation in Managerial Work.
Unit III	**Organization HRM and Controls**: Organizational Design & Organizational Structures, Delegation, Empowerment, Centralization, Decentralization, Organizational culture, Organizational climate and Organizational change, Talent management, Talent management Models and strategic human Resource planning; Recruitment and selection; Training and development, Performance Appraisal. Types of controls and controlling Techniques.
Unit IV	**Leading and Motivation:** Leadership, Power and authority, Leadership styles; Behavioural leadership, Situational leadership, Leadership skills, Leader as mentor and coach, Leadership during adversity and crisis; Handling employee and customer complaints, Team leadership. Motivation: Types of motivation, Relationship between motivation, performance and engagement, Content motivational theories.
Recommended Books	
1. Robert N Lussier, Management Fundamentals, 5th edition, Cengage Learning, 2013. 2. Stephen P. Robbins, Fundamentals of Management, Pearson Education, 2009. 3. Weihrich Koontz, Essentials of Management, fifth edition, Tata Mc Graw Hill, 1990. 4. Dubrin Andrew, Management Essentials, 9th edition, Cengage Learning, 2012.	

S.C.

BOS

AUC1-T: Indian Constitution							
Course Type	Course Credit	Contact Hours/Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
Audit Course	00	03	Lecture	--	50	3 Hours	TEE/MTE/ Assignment/ Attendance

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: Indian Constitution is a necessary course for B. Tech. (CSE) graduates. It helps them to know about their rights and knowledge about their constitution.

Course Outcomes	At the end of this course, the student will be able to:
CO1	define fundamental concepts of Indian constitution
CO2	explain the basic principles of Indian constitution
CO3	apply the Directive Principles of State Policy
CO4	Analyse the Constitutional Powers and Procedure
CO5	evaluate Federal structure and distribution of legislative and financial powers between the Union and the States

CO-PO Mapping Matrix for Course AUC 1

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
AUC1: Indian Constitution

Unit I	Basic features and fundamental principles, Meaning of the constitution law and constitutionalism, Historical perspective of the Constitution of India, Salient features and characteristics of the Constitution of India, Scheme of the fundamental rights, The scheme of the Fundamental Duties and its legal status
Unit II	The Directive Principles of State Policy – Its importance and implementation, Federal structure and distribution of legislative and financial powers between the Union and the States, Parliamentary Form of Government in India – The constitution powers and status of the President of India

S.C.

BOS

Unit III	Amendment of the Constitutional Powers and Procedure, The historical perspectives of the constitutional amendments in India Emergency Provisions: National Emergency, President Rule, Financial Emergency Local Self Government – Constitutional Scheme in India
Unit IV	Scheme of the Fundamental Right to Equality, Scheme of the Fundamental Right to certain Freedom under Article 19, Scope of the Right to Life and Personal Liberty under Article 21

Recommended Books

1. Robert N Lussier, Management Fundamentals, 5th edition, Cengage Learning, 2013.
2. Stephen P. Robbins, Fundamentals of Management, Pearson Education, 2009.
3. Weihrich Koontz, Essentials of Management, fifth edition, Tata Mc Graw Hill, 1990.
4. Dubrin Andrew, Management Essentials, 9th edition, Cengage Learning, 2012.

S.C.

BOS

Semester IV

PC/CSEAIML/8-T: Discrete Mathematical Structures								
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: 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: Discrete Mathematics is a core and an essential course for every graduate in Computer Science and Engineering. It provides a mathematical language for computer science to resolve many real-world problems by incorporating different methods applicable to various discrete structures. This course introduces set theory, propositional calculus, algebraic structures, recurrence relations and graph theory.

Course Outcomes	At the end of this course, the student will be able to:
CO1	Outline various discrete structures and the related operations.
CO2	Illustrate different discrete structures with the help of examples.
CO3	Apply appropriate techniques to solve problems related to discrete structures.
CO4	Justify the solutions with the help of proofs.
CO5	Combine techniques related to discrete structures for solving real world problems

CO-PO Mapping Matrix for Course PC/CSEAIML/8-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	-	-

S.C.

BOS

Course Content PC/CSEAIML/8-T: Discrete Mathematical Structures	
Unit I	**Set Theory**: Introduction to Set Theory, Venn Diagrams, Set Operations, Algebra of Sets, Duality, Finite, Infinite Sets and Counting Principle, Classes of Sets, Power Sets, Partitions, Multi Sets. **Relations**: Cartesian Product, Representation of Relations, Types of Relation, Equivalence Relations and Partitions, Partial Ordering Relations. **Functions:** Definition, Types of Functions, Composition of Functions, Inverse Function.
Unit II	**Logic and Propositional Calculus**: Introduction, Propositions and Compound Propositions, Basic Logical Operations, Propositions and Truth Tables, Tautologies and Contradictions, Logical Equivalence, Algebra of Propositions, Conditional and Bi-conditional Statements. **Algebraic Structures**: Group Axioms, Monoid, Semi-Groups, Subgroups, Abelian Group, Cosets, Normal Subgroup, Cyclic Group, Permutation Group, Lagrange's Theorem, Homomorphism, Isomorphism, Automorphism, Rings, Integral Domains and Fields, Splitting field.
Unit III	**Logic and propositional Calculus**: Boolean algebra, basic definitions, duality, truth tables, Boolean functions, basic logical operations on propositions, proposition and truth tables, tautologies and contradictions, algebra of propositions, rules of inference. **Lattice and Boolean algebra**: Relational to Partial ordering, Lattices and Hasse diagram, bounded lattices, distributive lattices, complemented lattices.
Unit IV	Graphs Theory: Introduction to Graphs, Multi Graph, Directed and Undirected Graphs, Subgraphs, Bipartite Graphs, Regular Graphs, Connected Graphs, Homomorphic and Isomorphic Graphs, cut points and Bridges, Paths and Circuits, Euler Graph, Hamiltonian Graph, Planar Graph, Euler Formula, Weighted Graphs, Dijkstra's Shortest Path Algorithm for Weighted Graphs, Trees, Spanning Trees, Minimum Spanning Tree (Prim's and Kruskal's Algorithm).

Recommended Books

1. Robert N J.P. Trembley and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill – 13th reprint, 2012.
2. Kenneth H. Rosen, Discrete Mathematics and its applications, 6th Edition, Tata McGraw Hill, 2011.
3. Richard Johnsonbaugh, Discrete Mathematics, 6th Edition, Pearson Education Asia, 2011.
4. S. Lipschutz and M. Lipson, Discrete Mathematics, Tata McGraw Hill, 3rd Edition, 2010.

S.C. BOS

PC/CSEAIML/9-T: Python Programming for 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: 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 objective of this course is to get the students familiar with basic concepts of Python programming, decision making and functions, file handling and object-oriented programming concepts, database programming and to implement machine learning concepts.

Course Outcomes	At the end of this course, the student will be able to:
CO1	define: installations, working, structures, control statements, operators, lists, object-oriented programming concepts, python libraries.
CO2	explain: conditional & control statements, strings, OOPs, file handling concepts, libraries and packages of python programming.
CO3	use: various python libraries such as numpy, matplotlib, pandas. apply: python programming constructs to solve real world problems.
CO4	categorize: datatypes, dictionaries, conditional & control statements, functions, python libraries.
CO5	compare: datatypes, dictionaries, conditional & control statements, functions, python libraries.
CO6	design: basic and advanced applications in python.

CO-PO Mapping Matrix for Course PC/CSEAIML/9-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	-	-	-	-	-	-	-
CO6	2	3	-	2	3	-	-	-	-	-	-	-
Average	2	1.4	1.4	2.2	1.5	-	3	-	-	2	-	-

S.C.

BOS

Course Content PC/CSEAIML/9-T: Python Programming for Machine Learning	
Unit I	Installation and Working with Python, Control flow, Tokens, Identifiers, Reserved keywords, Variables, Python basic Operators, Declaring and using Numeric data types: int, float, complex, using string data types, Scope of a Variable, Working with: String, List, Tuples and Dictionaries, Set. Conditional blocks using if, else and elif, For loops in python, While loops, Continue, Break, organizing python codes using functions, Powerful Lambda Function in python programming.
Unit II	Python NumPy: Array Slicing, Array Indexing, Data Types, Array Shape & Reshape, Array Join, Array Split, sort, filter. Numpy Random: Normal Distribution, Binomial Distribution, Poisson Distribution, Uniform Distribution, Logistic Distribution Python Pandas: Data Frames, Read CSV, Analyzing Data and Cleaning Data, Pandas Correlation, apply aggregation in Pandas. Regx in Python: package, metacharacters, sequence, sets, functions and operations.
Unit III	Object Oriented Programming: Concept of Class, Object and Instances, Constructor, Class Attributes and Destructors, Built-in Class Attributes, Inheritance, Method Overriding, Data Encapsulation, Overloading Operators, Data Hiding, Exception Handling, Programming using Oops concepts.
Unit IV	File Handling: Creating, Opening, Closing, Writing & Reading File Content, Deleting a File. Programming using file operations. Data Visualization using Matplotlib and Seaborn: Bar chart, Line plot, Histogram, Scatter Plot, Pie chart, Box Plot, Grouped Bar chart, Multiple box plot, Voilin Plot, Heat map, Tree map,
Recommended Books	
1. Chun, J Wesley, Core Python Programming, 2e, Pearson, 2007. 2. E. Balagurusamy, Introduction to Computing and Problem Solving Using Python, McGraw Hill Education, 2016. 3. Barry and Paul, Head First Python, 2e, O Reilly, 2010. 4. Lutz and Mark, Learning Python, 4e, O Reilly, 2009	

S.C.

BOS

PC/CSEAIML/10-T: Data Mining Techniques								
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: 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: Today's era is the era of information. Data is growing exponentially day by day. There is a need to process and analyse the data to extract knowledge from it, so that one can use that knowledge for decision making. This course provides introductory concepts of data mining and data warehousing. The course will be taught with a database as well as machine learning perspectives. The objective of the course is to provide a comprehensive understanding of data mining tasks and evaluation of results obtained out of data mining processes.

Course Outcomes	At the end of this course, the student will be able to:
CO1	**Outline** various types of data mining and data warehouse concepts and techniques.
CO2	**Explain** association of patterns, data mining functionalities, tasks of data mining.
CO3	**Apply** various classification, clustering correlation and association mining for extracting valuable information from data.
CO4	**Evaluate** the descriptive and predictive data mining models.
CO5	**Plan** a data mining process for discovering knowledge from real-world databases.
CO6	**Implement** data mining algorithms.

CO-PO Mapping Matrix for Course PC/CSEAIML/10-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	-	-	-	-	-	-	-
CO6	2	3	-	2	3	-	-	-	-	-	-	-
Average	2	1.4	1.4	2.2	1.5	-	3	-	-	2	-	-

S.C.

BOS

Course Content PC/CSEAIML/10-T: Data Mining Techniques	
Unit I	**Introduction to Data Mining:** Kind of data to be mined, Data Mining Functionalities, Technologies used in Data Mining, Applications of data Mining, Major Issues in Data Mining. **Data Warehouse:** Introduction, Data Warehouse and Database Systems, Data Warehouse Architecture, Data Warehouse Models, Data Cube and OLAP, Multidimensional data Model, Concept Hierarchies, OLAP operations **Pattern Mining**: Mining Frequent Patterns, Associations and Correlations, Frequent Itemset Mining using Apriori Algorithm, Generating Association Rules from Frequent Itemset. Pattern Growth Approach for Mining Frequent Itemset, Pattern evaluation Methods
Unit II	**Classification:** Introduction, Classification using Decision Tree Induction, Bayesian Classification Methods, Rule Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy. **Introduction to advanced classifiers**: k-Nearest Neighbor, Support Vector Machine, Artificial Neural Network.
Unit III	**Cluster Analysis:** Introduction, overview of Basic Clustering Methods, **Partitioning Methods**: k-mean, k-medoids, **Hierarchical Methods:** Agglomerative versus Divisive Hierarchical Clustering, Distance Measures in Algorithmic Methods, Balanced Iterative Reducing and Clustering using Hierarchies (BIRCH), Chameleon: Multiphase Hierarchical Clustering Using Dynamic Modelling, Probabilistic Hierarchical Clustering, **Density-based methods:** DBSCAN, OPTICS, DENCLUE, **Grid-based Methods:** STING, CLIQUE, **Evaluation of Clustering.**
Unit IV	**Outlier Detection:** Introduction, types of outliers, challenges of outlier detection. Outlier detection methods: statistical approaches, proximity-based approaches, clustering based approaches, classification-based approaches, Outlier detection in high dimensional data.
Recommended Books	
1. Jiawei Han, Micheline Kamber and Jian Pei, Data Mining Concepts and Techniques, Morgan Kaufmann Publishers,Third Edition, July 2011. 2. Alex Berson, Stephen J. Smith, Data Warehousing, Data Mining & OLAP, Tata McGraw Hill, 2004. 3. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Introduction to Data Mining, Pearson Education, 2014. 4. K. P. Soman, Shyam Diwakar and V. Ajay, Insight into Data Mining Theory and Practice, Easter Economy Edition, Prentice Hall of India, 2009.	

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BOS

PC/CSEAIML/11-T: Computer Networks								
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.

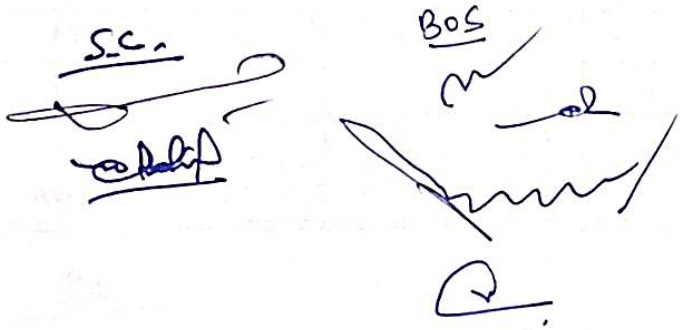
Course Outcomes	At the end of this course, the student will be able to:
CO1	define the terms and concepts of data communication and computer networking including types of network topologies,
CO.2	understand and describe various concepts of data communication and computer networking including network topologies,
CO3	apply the techniques learnt here in the design and evaluation of computer and communication networks
CO4	differentiate various types of: computer and data communication networks, network topologies, switching and multiplexing mechanisms, error control mechanisms, routing protocols;
CO5	compare, evaluate and choose between candidate: network topologies, transmission media

CO-PO Mapping Matrix for Course PC/CSEAIML/11-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	-	-
Average	2	1.4	1.4	2.2	1.8	-	3	2.4	-	2	-	-

S.C. BOS

Course Content PC/CSEAIML/11-T: Computer Networks	
Unit I	Network concepts: goals and applications of computer networks; topologies; categories of networks - LAN, MAN, WAN; point-to point, and broadcast networks. Networks architecture: concepts of protocols & services; OSI model and functions of its layers; TCP/IP reference model. TCP/IP: elements of transport protocols; transmission control protocol (TCP); user datagram protocol (UDP); internet protocol (IP).
Unit II	Data communication concepts: components of a data communication system; transmission modes; transmission media – guided and wireless media; introduction to switching (circuit, message and packet) and multiplexing (frequency division and time division); modem. Introduction to SMDS, X.25, ISDN networks, frame relay and ATM networks.
Unit III	Framing and error control: framing techniques; error control - error detection & correction. Data link control: acknowledgments, sliding window protocols. Multiple Access Control, flow and error control, token bus, token ring, DQDB.
Unit IV	Routing: deterministic and adaptive routing; centralized and distributed routing; shortest-path; flooding; flow-based; optimal; distance-vector, link-state, hierarchical; routing for mobile hosts; broadcast and multicast routing. Congestion control: principles of congestion control; traffic shaping; choke packets; load shading; RSVP.
Recommended Books	
1. Andrews, Tananbaum, Computer Networks – PHI. 2. Fred Halsall, Data Communications, Computer Networks and Open Systems, 4e, 3. Addison Wesley. 4. William Stalling, Data and Computer Communications, 5e, PHI. 5. Behrouz, Frozen, Introduction to Data Communications and Networking, Tata McGraw Hill.	



PC/CSEAIML/9-P: Soft Lab- Python Programming for Machine Learning							
Course Type	Course Credit	Contact Hours/Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
Practical	02	04	Practical/ Lab Work	25	25	3 hours	TEE/ Practical File

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 get the students familiar with basic concepts of Python programming, decision making and functions, file handling and object-oriented programming concepts, database programming and to implement machine learning concepts.

Course Outcomes	At the end of this course, the student will be able to:
CO1	define: installations, working, structures, control statements, operators, lists, object-oriented programming concepts, python libraries.
CO2	explain: conditional & control statements, strings, OOPs, file handling concepts, libraries and packages of python programming.
CO3	use: various python libraries such as numpy, matplotlib, pandas. apply: python programming constructs to solve real world problems.
CO4	categorize: datatypes, dictionaries, conditional & control statements, functions, python libraries.
CO5	compare: datatypes, dictionaries, conditional & control statements, functions, python libraries.
CO6	design: basic and advanced applications in python.

CO-PO Mapping Matrix for Course PC/CSEAIML/9-P

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	-	3	1	-	-	-	-
CO2	2	1	1	3	1	-	3	2	-	-	-	-
CO3	3	1	1	3	3	-	3	3	-	-	-	-
CO4	3	3	1	3	1	-	3	3	-	-	-	-
CO5	3	1	1	3	3	-	3	3	-	-	-	-
CO6	3	3	3	3	3	-	3	3	-	-	-	-
Average	2.5	2	1.3	2.6	2	-	3	2.5	-	-	-	-

S.C.

BOS

PC/CSEAIML/10-P: Soft Lab- Data Mining							
Course Type	Course Credit	Contact Hours/Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
Practical	02	04	Practical/ Lab Work	25	25	3 hours	TEE/ Practical File

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 lab is to enable students to use tools for applying advanced data reduction, classification and clustering techniques.

Course Outcomes	At the end of this course, the student will be able to:
CO1	**Apply** advanced data mining algorithms.
CO2	**Usages** of modern data mining tools such as WEKA, R/Python packages.
CO3	**Evaluate** the performance of data mining models.
CO4	**Design** advanced data mining experiments.
CO5	**Create** lab assignment record that includes problem definitions, solutions, results and conclusions.
CO6	**demonstrate** ethical practices, self-learning and team spirit.

CO-PO Mapping Matrix for Course PC/CSEAIML/10-P

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	1	1	-	3	1	-	-	-	-
CO2	2	1	1	3	1	-	3	2	-	-	-	-
CO3	3	1	1	3	3	-	3	3	-	-	-	-
CO4	3	3	1	3	1	-	3	3	-	-	-	-
CO5	3	1	1	3	3	-	3	3	-	-	-	-
CO6	3	3	3	3	3	-	3	3	-	-	-	-
Average	2.5	2	1.3	2.6	2	-	3	2.5	-	-	-	-

S.C.

BOS

HSMC/5-T: Entrepreneurship Development Management								
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: Fundamentals of Management for Engineers is a necessary course for B. Tech. (CSE) graduates wishing to work with organizations in their near future. It helps them acquiring managerial, planning and decision-making skills. This course makes students ready to work in teams as well as play leadership roles.

Course Outcomes	At the end of this course, the student will be able to:
CO1	**define** fundamental concepts of management
CO2	**explain** the basic principles of management related to planning and decision making, HRM and motivation, and leadership.
CO3	**apply** the managerial skills to solve real world management problems.
CO4	**Analyze** the quality of a statistical and machine learning models.
CO5	**evaluate** a business model based on principles of management.

CO-PO Mapping Matrix for Course HSMC/5-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	-	-

Sc.

BOS

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Course Content HSMC/5-T: Entrepreneurship Development Management	
Unit I	Entrepreneurship – Concept, Factors affecting growth of Entrepreneurship, Types of Entrepreneurs, Requirements of Entrepreneurial structure. x Entrepreneurial Culture -Elements of culture, Steps to change Entrepreneurial culture, Entrepreneurial v/s administrative culture. x Theories of Entrepreneurship-Schumpeter Dynamic Entrepreneurship Innovation Theory, Theory of High Achievement by McClelland, Theory of Personnel Resourcefulness
Unit II	Entrepreneurial Environment- Significance, SWOC Analysis, Problems of Entrepreneurship x Financial Analysis of Entrepreneurial Venture- Significance, Tools of Financial Analysis, Sources of development finance x Social Entrepreneurship- Features, Importance, Arguments (for and against) Social Entrepreneurship, Women Entrepreneurs – concept and special Government schemes for women entrepreneurs in India.
Unit III	Project - Concepts and Classification of Project, Search of Business Idea, Project Cycle. x Project formulation-----Steps for project formulation, Project Design and network analysis – concept and network analysis techniques: PERT/ CPM. x Project Management – Concept, Phases, Project Identification and Project Feasibility Analysis.
Unit IV	Incentives – Need, Promotion and development Entrepreneurship-Types of Assistance and incentives -Fiscal, Financial, Promotional, Marketing, and Organisational. x NPSD - National Policy for Skill Development and Entrepreneurship 2015. x Institutions in aid of Entrepreneurship Development - The National institute for Entrepreneurship and small business development, District Industry Centre (DIC), National Alliance of young Entrepreneurs
Recommended Books	
1. Anil Kumar S, Poornima S.C., Mini K. Abraham, Jayashree. K. (2003), 2. Entrepreneurship Development (pp- 64-66). New Delhi, New Age International Publishers. 3. 3. Bhowmik S.R, Bhowmik.M (2008), Entrepreneurship (14-16). New Delhi, New Age International Publishers 4. https://mu.ac.in/wp-content/uploads/2022/05/Entrepreneurial-Management-English-Version.pdf	

S.C.

BOS

AUC2: Environmental Sciences							
Course Type	Course Credit	Contact Hours/Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
Audit Course	00	03	Lecture	--	50	3 Hours	TEE/MTE/ Assignment/ Attendance

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: 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.

Course Outcomes	At the end of this course, the student will be able to:
CO1	state the environment related issues and challenges in sustainable development
CO2	demonstrate the understanding of various environment hazards and means of protection against these hazards.
CO3	apply irreplaceable tool to provide first-hand knowledge on various environmental aspects in the entire learning process.
CO4	analyze impacts of human business and developmental activities on the environment.
CO5	design and evaluate strategies for sustainable management of environmental eco-systems.

CO-PO Mapping Matrix for Course AUC2

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	-	-

S.C.

BOS

Course Content AUC2: Environmental Sciences	
Unit I	Multidisciplinary nature of Environmental studies: Definition, scope and importance, need for public awareness; Concept, Structure and function of an ecosystem: Producers, consumers and decomposers, Energy flow in the ecosystem ,Ecological succession ,Food chains, Food webs and ecological pyramids; Introduction, types, 27 characteristics features, structure and function of Forest ecosystem, Grassland ecosystem ,Desert ecosystem, Aquatic ecosystem (Ponds, Stream, lakes, rivers, oceans, estuaries); Biodiversity: Introduction, Definition: genetic, species and ecosystem diversity, Bio-geographical classification of India, Value of biodiversity: consumptive use, productive use, social ethical, aesthetic and option values; Biodiversity at global, national and local level, India as a megadiversity nation, Hot-spot of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.
Unit II	Renewable and non-renewable resources, Natural resources and associated problems ,Forest resources: Use and over-exploitation, deforestation, case studies, Timber extraction, mining, dams and their effects on forests and tribal people; Water resources: Use and over utilization of surface and ground water, floods, droughts conflicts over water, dams benefits and problems; Mineral resources: Use and exploitation, environmental effects of extracting and mineral resources; Food resources: World food problem, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity; Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies; Land resources: Land as a resource, land degradation, main induced landslides, soil erosion and desertification, Role of an individual in conservation of natural resources, Equitable use of resources for suitable lifestyle.
Unit III	Definition of Environment Pollution; Causes, effects and control measures of: Air Pollution, Water Pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards; Solid waste Management: Causes effects and control measures of urban and industrial wastes; Role of and individual in prevention of pollution, Pollution case studies; Disaster management: floods, earthquake, cyclone and landslides; Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Case studies; different laws related to environment: Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act.; Issues involved in enforcement of environmental legislation, Public awareness
Unit IV	Social issues and the Environment: From unsustainable to Sustainable development, Urban problems related to energy; Water conservation, rain water harvesting, watershed management; Resettlement and rehabilitation of people; its problem and concern, case studies; Environment ethics: Issues and possible solutions; Wasteland reclamation; Consumerism and waste products; Human Population growth, variation among nation, Population explosion-

S.C.

BOS

	Family Welfare Programme, Environment and human health , Human Rights, Value Education, HIV/AIDS, Women and Child Welfare, Role of Information Technology in Environment and human health, Case Studies.

Recommended Books

1. Erach Bharucha, Environmental Studies for Undergraduate Courses, University press pvt. Ltd. (India), 2005.
2. Dr. D. D. Mishra, Fundamental concepts in Environmental studies, S. Chand publications, 2008.
3. Dr. S .V .S. Rana, Essentials of Ecology and Environmental Science, PHI Learning Pvt. Ltd Delhi, 2013.
4. Anil Kumar De, Environmental Chemistry, Wiley Eastern Limited, 1994.
5. T. G. Miller, Environmental Science, Wadsworth Publishing Co, 13th4edition, 2013.
6. 6. P. D. Sharma, Ecology and Environment, Rastogi publications, 13th edition, 2003.

S.C.

BOS

EEC1: 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.							

S.C.

BOS

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

S.C.

BOS

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	-	-	-	-	-

S.C. BOS

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.

S.C.

BOS

PC/CSEAIML/14-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/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	-
Average	2	1.4	1.4	2.2	1.8	-	3	2	1	-	2	-

S.C. BOS

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Course Content PC/CSEAIML/14-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.
Unit IV	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.

BOS

S.C.

PC/CSEAIML/15-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/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	-
CO6	3	3	3	1	3	-	3	2	1	-	2	-
Average	2	1.4	1.4	2.2	1.8	-	3	2	1	-	2	-

S.C. BOS

Course Content PC/CSEAIML/15-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.
Unit III	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.
Unit IV	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 Cookbook Problems and Solutions for Android Developers, 2e, O'Reilly,2017.	

S.C.

BOS

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	-

S.C.

BOS

PC/CSEAIML/15-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/15-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	-

S.C.

BOS

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	-	-

SC

BoS

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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	

S.C.

BOS

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.							

BoS

S.C.

SEMESTER VI

EEC3: Industry/ Research Lab/ Internship							
Course Type	Course Credit	Contact Hours/Week	Delivery Mode	Maximum Marks		Exam Duration	Assessment Methods
				External	Internal		
Employment Enhancement Courses	18	18	Presentation	350	100	3 Hours	Report Writing / Viva-Voce

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

An internal evaluation is done by internal examiner/(s) appointed by the Chairperson.

Significance and originality of the problem addressed, and the solution provided: 20

Knowledge of the problem domain and tool used (VIVA-VOCE):25

Report Writing: 20

Judgement of the skill learnt, and system developed: 20

Level of ethics followed: 15

Course Objectives: Students will do an Industrial Training of 4 to 6 weeks after fourth semester. They are expected to learn novel skills and develop some software application during the training period. The training will be evaluated in the fifth semester.

S.C. BOS

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