

B. Tech Computer Science and Engineering (Artificial Intelligence and Machine Learning) Modified Scheme of Studies/Examination

Semester VII

S. No.	Course No.	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule				Duration of Exam (Hrs.)
						Major Test	Minor Test	Practical	Total	
1	PC- CS-AIML-401A	Data Science with Programming	R3:0:0	3	3	75	25	0	100	3
2	HSS-403A	Universal Human Values II: Understanding Harmony	3:0:0	3	3	75	25	0	100	3
3	OE	OE Elective*-II	3:0:0	3	3	75	25	0	100	3
4	PE	Elective* - I	3:0:0	3	3	75	25	0	100	3
5	PE	Elective* - II	3:0:0	3	3	75	25	0	100	3
6	PE-LA	Elective* – II Lab	0:0:2	2	1	0	40	60	100	3
7	PC- CS-AIML-407LA	R Programming Lab	0:0:2	2	1	0	40	60	100	3
8	PC- CS-AIML-409LA	Project** - 1	0:0:10	10	5	0	40	60	100	3
9	PC- CS-AIML-413LA	Industrial Training***	0:0:0	0	3	0	100	0	100	3
		Total		29	25	300	320	180	800	

Lesson Plan

Name of the Faculty:		Ms. Urvashi	
Discipline:		B.Tech (CSE)	
Semester:		7th	
Subject:		Data Science in R Progranning (PC-CS-AIML-401A)	
Course Outcome:		CO1	To understand Basics of Data Science statistics, Identify probability distributions.
		CO2	To perform basics statistical analysis Using R.
		CO3	To Apply basic tools to carry out Exploratory data analysis.
		CO4	To explore the components data science Process to interact via machine learning models
WorkLoad(Lecture/Practical) perweek(Inhours):		Lecture-4	
S.No	Lecture No.	Theory	
		Topic(IncludingAssignment/ Test/)	Pedagogy (PPT/Chalk and Board/Activity/Case Study)
1.	L1	UNIT:-1 Introduction to Data Science	Chalk and Board
2.	L2	History of Data Science, Data Science Process	Chalk and Board
3.	L3	Benefits and Uses of data science and big data	Chalk and Board
4.	L4	Big data	Chalk and Board

5.	L5	How does Data Science relate to other fields	Chalk and Board
6.	L6	Data science tools	Chalk and Board
7.	L7	Data science tools	Chalk and Board
8.	L8	Data analysis and its types.	Chalk and Board
9.	L9	Data analysis and its types.	Chalk and Board
10.	L10	Discussion about Data Science and Sub Fields	Chalk and Board
11.	L11	Data Preprocessing Introduction	Chalk and Board,
12.	L12	Data Preprocessing	Chalk and Board,
13.	L13	Data types	Chalk and Board
14.	L14	Data forms	Chalk and Board
15.	L15	Various data preprocessing operations	Chalk and Board
16.	L16	Data cleaning	Chalk and Board
17.	L17	Data integration	Chalk and Board
18.	L18	Data transformation	Chalk and Board
19.	L19	Data transformation	Chalk and Board
20.	L20	Data reduction	Chalk and Board

21.	L21	Data discretization.	Chalk and Board
22.		Sessional Test	Chalk and Board
23.	L22	UNIT 2:	Offline
24.	L23	Data plotting and visualization – Introduction	Chalk and Board
25.	L24	Data visualization software	Chalk and Board
26.	L25	Data visualization libraries	Chalk and Board
27.		Assignment	Offline
28.	L26	Types of data visualization	Chalk and Board and PPT
29.	L27	Basic and specialized data visualization tools.	Chalk and Board
30.	L28	Role of statistics and probability in data science	Chalk and Board
31.	L29	Descriptive statistics – Measures of frequency, central tendency, dispersion, position	Chalk and Board
32.	L30	Dependence and Independence, Conditional Probability	Chalk and Board
33.	L31	Bayesian probability	Chalk and Board
34.	L32	Random Variables, probability distribution	Chalk and Board

35.		PYQ Discussion	
36.	L33	UNIT 3: What is R, Uses, Advantages and disadvantages, Basics in R- Syntax	Chalk and Board
37.	L34	Comments in R, reserved words, identifiers, constants, variables	Chalk and Board
38.	L35	operators and its precedence	Chalk and Board
39.	L36	Strings -Reading strings	Chalk and Board
40.	L37.	Data types and operations in R: Basic Data types	Chalk and Board
41.	L38.	Vectors, Lists	Chalk and Board
42.	L39.	Matrices, Arrays	Chalk and Board
43.	L40	Factors, Data Frames, Data type conversion	Chalk and Board
44.		Sessional Test	Offline
45.	L41	UNIT-4: CSV Files: Getting and Setting working Directory, creating, reading, analyzing, writing	Chalk and Board
46.	L42	Microsoft Excel: Install xlsx package, verifying and loading, creating, reading, writing.	Chalk and Board
47.	L43	Regression Methods-Linear, polynomial and logistic	Chalk and Board
48.	L44	classification methods	Chalk and Board

49.	L45	clustering methods	Chalk and Board
50.	L46	Hidden Markov Model	Chalk and Board
51.	L47	Data science in Healthcare, Data Science in Ecommerce	Chalk and Board
52.	L48	Science in Entertainment Industry	Chalk and Board
53.		Sessional	Offline

Lesson Plan

Name of the Faculty:		Mr. Shiv Dutt	
Discipline:		B.Tech (CSE-AIML)	
Semester:		7th	
Subject:		Robotics and Intelligent Systems (OE-CS- AIML401)	
Course Outcome:		CO1	To Understand the basic terminologies in Robotics to develop intelligent systems
		CO2	To Apply the random search and heuristic search for intelligent systems.
		CO3	To Understand the abstractions and reasoning for intelligent systems,
		CO4	To Identify the characteristics and architectures of algorithms of multi agent systems, Identify different application areas of Intelligent Systems
WorkLoad(Lecture/Practical) perweek(Inhours):		Lecture-3	
S.No	Lecture No.	Theory	
		Topic(Including Assignment/ Test/)	Pedagogy (PPT/Chalk and Board/Activity/Case Study)
1.	L1	UNIT:-1 Introduction to robotics	Chalk and Board
2.	L2	History, Characteristics	Chalk and Board
3.	L3	Robot applications- Manufacturing industry, defense, rehabilitation, medical	Chalk and Board

4.	L4	Robot mechanisms	Chalk and Board
5.	L5	type of robots	Chalk and Board
6.	L6	Basic tasks of a robot	Chalk and Board
7.	L7	Advantages & Disadvantages of robot,	Chalk and Board
8.	L8	Challenges in Robotics	Chalk and Board
9.	L9	Unit2: Components of robot: Robot components	Chalk and Board
10.	L10	power source, controllers, manipulator	Chalk and Board
11.	L11	actuator drive and its types	Chalk and Board,
12.	L12	end effector, classifying robots	Chalk and Board,
13.		Sessional	Offline
14.	L13	sensors in robots and its types, transducers,)	Chalk and Board
15.	L14	means for programming (Robot programming and interfaces)	Chalk and Board
16.	L15	means for programming (Robot programming and interfaces)	Chalk and Board
17.	L16	Degrees of freedom(DOF)	Chalk and Board
18.	L17	UNIT 3: Intelligent Systems	Chalk and Board

19.	L18	Knowledge acquisition	Chalk and Board
20.	L19	Computational intelligence	Chalk and Board
21.	L20	Rule-based systems	Chalk and Board
22.	L21	Forward-chaining (a data-driven strategy),	Chalk and Board
23	L22	Conflict resolution	Offline
24.	L23	Backward chaining (a goaldriven strategy)	Chalk and Board
25.	L24	Sources of uncertainty, Bayesian updating	Chalk and Board
26.	L25	Uncertainty theory	Chalk and Board
27.		Sesional	Offline
28.	L26	UNIT4: Possibility theory: fuzzy sets and fuzzy logic	Chalk and Board and PPT
29.	L27	Object-oriented systems ,Data abstraction, Inheritance, Encapsulation	Chalk and Board
30.	L28	Unified Modeling Language (UML)	Chalk and Board
31.	L29	Dynamic (or late) binding	Chalk and Board
32.	L30	Key Application Areas	Chalk and Board
33.	L31	Expert System	Chalk and Board

34.	L32	Decision Support Systems	Chalk and Board
35.	L33	Doubt Session	Chalk and Board
36.	L34		Chalk and Board
37.	L35	Deep Learning: Speech and vision, natural Language processing	Chalk and Board
38.	L36	Information Retrieval, Semantic Web.	Chalk and Board
39.		SESSIONAL	OFFLINE

Lesson Plan

Name of the Faculty:		Ms. Ruchi Gupta	
Discipline:		B.Tech (CSE-AIML)	
Semester:		7th	
Subject:		UHV (HSS-403A)	
Course Outcome:		CO1	Development of a holistic perspective based on self-exploration
		CO2	Understanding (or developing clarity) of the harmony in the human being.
		CO3	Strengthening of self-reflection..
		CO4	Development of commitment and courage to act.
WorkLoad(Lecture/Practical) perweek(Inhours):		Lecture-3	
S.No	Lecture No.	Theory	
		Topic(Including Assignment/ Test/)	Pedagogy (PPT/Chalk and Board/Activity/Case Study)
1.	L1	Module:-1 Course Introduction - Need, Basic Guidelines, Content and Process for Value Education	Chalk and Board
2.	L2	Purpose and motivation for the course, recapitulation from Universal Human Values-I 2..	Chalk and Board
3.	L3	Self-Exploration– what is it? - Its content and process; ‘Natural Acceptance’	Chalk and Board

4.	L4	Experiential Validation- as the process for self-exploration	Chalk and Board
5.	L5	Continuous Happiness and Prosperity- A look at basic Human Aspirations	Chalk and Board
6.	L6	Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority	Chalk and Board
7.	L7	Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario	Chalk and Board
8.	L8	Method to fulfil the above human aspirations: understanding and living in harmony at various levels.	Chalk and Board
9.	L9	Module2: Understanding Harmony in the Human Being - Harmony in Myself!	Chalk and Board
10.	L10	Understanding human being as a co-existence of the sentient 'I' and the material 'Body'	Chalk and Board
11.	L11	Understanding the needs of Self ('I') and 'Body' - happiness and physical facility	Chalk and Board,
12.	L12	Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)	Chalk and Board,
13.		Sessional	Offline

14.	L13	Understanding the characteristics and activities of 'I' and harmony in 'I'	Chalk and Board
15.	L14	Understanding the harmony of I with the Body: Sanyam and Health	Chalk and Board
16.	L15	correct appraisal of Physical needs, meaning of Prosperity in detail	Chalk and Board
17.	L16	Programs to ensure Sanyam and Health	Chalk and Board
18.	L17	Module 3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship	Chalk and Board
19.	L18	Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness;	Chalk and Board
20.	L19	Trust and Respect as the foundational values of relationship	Chalk and Board
21.	L20	Understanding the meaning of Trust; Difference between intention and competence	Chalk and Board
22.	L21	Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship	Chalk and Board
23	L22	Understanding the harmony in the society (society being an extension of family):	Offline
24.	L23	Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive	Chalk and Board

		Human Goals	
25.	L24	Visualizing a universal harmonious order in society- Undivided Society,	Chalk and Board
26.	L25	Universal Order- from family to world family.	Chalk and Board
27.		Sesional	Offline
28.	L26	Module 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence	Chalk and Board and PPT
29.	L27	Understanding the harmony in the Nature 2.	Chalk and Board
30.	L28	Interconnectedness and mutual fulfilment among the four orders of nature- recyclability	Chalk and Board
31.	L29	Interconnectedness and mutual fulfilment among the four orders of nature in self- regulation in nature	Chalk and Board
32.	L30	Understanding Existence as Co-existence of mutually interacting units in all-pervasive space	Chalk and Board
33.	L31	Holistic perception of harmony at all levels of existence.	Chalk and Board
34.	L32	Module 5: Holistic perception of harmony at all levels of existence.	Chalk and Board
35.	L33	Natural acceptance of human values Definitiveness of	Chalk and Board

		Ethical Human Conduct and Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order	
36.	L34	Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.	Chalk and Board
37.	L35	Case studies of typical holistic technologies, management models and production systems	Chalk and Board
38.	L36	Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations and Sumup	Chalk and Board
39.		SESSIONAL	OFFLINE

Lesson Plan

Name of the Faculty:		Mr. Ravi	
Discipline:		B.Tech (CSE-AIML)	
Semester:		7 th	
Subject:		Soft Computing (PC-CS- AIM -417A)	
Course Outcome:		CO1	The main objective of the Soft Computing Techniques to Improve Data Analysis
		CO2	To strengthen the dialogue between the statistics and soft computing research communities in order to cross-pollinate both fields
		CO3	To develop Solutions and generate mutual improvement activities
		CO4	To develop practical data analysis skills, which can be applied to practical problems
WorkLoad(Lecture/Practical) per week(In hours):		Lecture-3	
S.No	Lecture No.	Theory	
		Topic(Including Assignment/ Test/)	Pedagogy (PPT/Chalk and Board/Activity/Case Study)
1.	L1	UNIT:-1 Introduction: What is Soft Computing.,	Chalk and Board
2.	L2	Difference between Hard and Soft computing	Chalk and Board

3.	L3	Difference between Hard and Soft computing	Chalk and Board
4.	L4	Requirement of Soft computing,	Chalk and Board
5.	L5	Requirement of Soft computing,	Chalk and Board
6.	L6	Major Areas of Soft Computing,	Chalk and Board
7.	L7	Applications of Soft Computing.	Chalk and Board
8.	L8	Doubt Session.	Chalk and Board
9.	L9	Unit2: Neural Network, ,	Chalk and Board
10.	L10	Learning rules and various	Chalk and Board
11.	L11	activation functions, Single layer	Chalk and Board,
12.	L12	Perceptron, Back Propagation networks	Chalk and Board,
13.		Sessional	Offline
14.	L13	Architecture of Backpropagation (BP) Networks	Chalk and Board
15.	L14	Backpropagation Learning	Chalk and Board
16.	L15	Introduction to counter propagation	Chalk and Board
17.	L16	Adaptive Resonance theory and Self Organizing Map, Recent Applications	Chalk and Board

18.	L17	UNIT 3: Fuzzy Systems: Fuzzy logic, fuzzy sets - properties -	Chalk and Board
19.	L18	operations on fuzzy sets	Chalk and Board
20.	L19	fuzzy relations - operations on fuzzy relations	Chalk and Board
21.	L20	Fuzzy membership functions	Chalk and Board
22.	L21	Fuzzification	Chalk and Board
23.	L22	Methods of membership value assignments	Offline
24.	L23	Methods of membership value assignments – intuition	Chalk and Board
25.	L24	inference – rank ordering	Chalk and Board
26.	L25	Lambda – cuts for fuzzy sets, Defuzzification methods	Chalk and Board
27.		Sesional	Offline
28.	L26	UNIT4: Genetic Algorithm: History of Genetic Algorithms(GA),	Chalk and Board and PPT
29.	L27	Working Principle	Chalk and Board
30.	L28	Various Encoding methods	Chalk and Board
31.	L29	,Fitness function	Chalk and Board
32.	L30	GA Operators-Reproduction, Crossover, Mutation,	Chalk and Board

33.	L31	GA Operators-Reproduction, Crossover, Mutation,	Chalk and Board
34.	L32	Convergence of GA	Chalk and Board
35.	L33	Bitwise operation in GA,	Chalk and Board
36.	L34	Multi-level Optimization,	Chalk and Board
37.	L35	Genetic-neuro hybrid systems,	Chalk and Board
38.	L36	Genetic Fuzzy rule based system	Chalk and Board
39.		SESSIONAL	OFFLINE

Lesson Plan

Name of the Faculty:		Ms. Sangeeta	
Discipline:		B.Tech (CSE-AIML)	
Semester:		7th	
Subject:		Deep Learning (PE-CS-AIML423A)	
Course Outcome:		CO1	To Recognize the characteristics of deep learning models that are useful to solve real-world problems.
		CO2	To Understand different methodologies to create application using deep nets
		CO3	To Identify and apply appropriate deep learning algorithms for analyzing the data for variety of problems.
		CO4	To Implement different deep learning algorithms. Design the test procedures to assess the efficacy of the developed model. Combine several models in to gain better results
WorkLoad(Lecture/Practical) perweek(Inhours):		Lecture-3	
S.No	Lecture No.	Theory	
		Topic(IncludingAssignment/ Test/)	Pedagogy (PPT/Chalk and Board/Activity/Case Study)
1.	L1	UNIT:-1 Basics of Machine Learning algorithms	Chalk and Board
2.	L2	Maximum likelihood estimation	Chalk and Board
3.	L3	Maximum likelihood estimation	Chalk and Board

4.	L4	Building machine learning algorithm	Chalk and Board
5.	L5	Neural Networks Multilayer Perceptron	Chalk and Board
6.	L6	Back-propagation algorithm and its variants	Chalk and Board
7.	L7	Stochastic gradient decent	Chalk and Board
8.	L8	Curse of Dimensionality	Chalk and Board
9.	L9	Unit2: Deep Learning Architectures, Representation Learning, Width and Depth of Neural Networks, Activation Functions: RELU	Chalk and Board
10.	L10	LRELU	Chalk and Board
11.	L11	ERELU	Chalk and Board,
12.	L12	Unsupervised	Chalk and Board,
13.		Sessional	Offline
14.	L13	Training of Neural Networks	Chalk and Board
15.	L14	Restricted Boltzmann Machines	Chalk and Board
16.	L15	Auto Encoders	Chalk and Board
17.	L16	Deep Learning Applications	Chalk and Board

18.	L17	UNIT 3: Convolutional Neural Networks,	Chalk and Board
19.	L18	Architectural Overview, Motivation, Layers	Chalk and Board
20.	L19	Filters	Chalk and Board
21.	L20	Parameter sharing	Chalk and Board
22.	L21	Regularization	Chalk and Board
23	L22	Sesional	Offline
24.	L23	Popular CNN Architectures	Chalk and Board
25.	L24	ResNet	Chalk and Board
26.	L25	AlexNet - Applications	Chalk and Board
27.		Sesional	Offline
28.	L26	UNIT4: Transfer Learning Techniques	Chalk and Board and PPT
29.	L27	Variants of CNN: DenseNet	Chalk and Board
30.	L28	PixelNet	Chalk and Board
31.	L29	Recurrent Neural Networks	Chalk and Board
32.	L30	Bidirectional	Chalk and Board

33.	L31	RNNs	Chalk and Board
34.	L32	Encoder-decoder	Chalk and Board
35.	L33	sequence to sequence architectures -	Chalk and Board
36.	L34	Doubt Session	Chalk and Board
37.	L35	BPTT for training RNN,.	Chalk and Board
38.	L36	Long Short Term Memory Networks	Chalk and Board
39.		SESSIONAL	OFFLINE

Name of the Faculty:	Ms. Tamnna	
Discipline:	B.Tech (CSE-AIML)	
Semester:	7th	
Subject:	Deep Learning Lab (PC-CS AIML- 423LA)	
Course Outcome:		
	CO1	To understand the deep learning.
	CO2	To perform basics deep learning networks
	CO3	To apply various deep learning networks in real world life.
	CO4	To implement deep learning modules

LIST OF PRACTICALS

1. Write a program to implement different activation functions to train Neural Network.
2. Write a program to implement different Learning Rules.
3. Write a program to implement Perceptron Networks.
4. Write a program to implement Adaline network for system identification.
5. Write a program to implement Madaline network
6. Write a program to implement Pattern matching using different rules.
7. Create a project that focuses on how machine learning is used in healthcare.
8. Project related to application of machine learning in business analysis.
9. Project related to application of machine learning in sports analytics.
10. Project related to application of machine learning in Time Series Analysis & Forecasting.

Name of the Faculty:	Ms. Urvashi	
Discipline:	B.Tech (CSE-AIML)	
Semester:	7th	
Subject:	R Programming Lab (PC-CS AIML- 407LA)	
Course Outcome:		
	CO1	Install and use R for simple programming tasks. Extend the functionality of R by using add-on packages.
	CO2	To perform basics statistical analysis Using R.
	CO3	To Apply basic tools to carry out Exploratory data analysis
	CO4	To explore the components data science Process to interact via machine learning models.

LIST OF PRACTICALS

1. Write an R script, to create R objects for calculator application and save in a specified location in disk.
2. Write an R script to find basic descriptive statistics using summary, str, quartile function on sample datasets.
3. Write an R script to find subset of dataset by using subset (), aggregate () functions on sample dataset.
4. Write an R script for Reading different types of data sets (.txt, .csv) from web and disk and writing in file in specific disk location.
5. Write an R script for Reading Excel data sheet and XML dataset.
6. Find the data distributions using box and scatter plot of sample dataset.
 - a. Find the outliers using plot.
 - b. Plot the histogram, bar chart and pie chart on same data.
7. How to find a correlation matrix and plot the correlation on sample data set.
 - a. Plot the correlation plot on dataset and visualize giving an overview of relationships among data
 - b. Analysis of covariance: variance (ANOVA), if data have categorical variables

8. Import a data from web storage. Name the dataset and now do Logistic Regression to find out relation between variables that are affecting the admission of a student in a institute based on his or her GRE score, GPA obtained and rank of the student. Also check the model is fit or not. require (foreign), require(MASS).
9. Apply multiple regressions, if data have a continuous independent variable. Apply on above dataset
10. Apply regression Model techniques to predict the data on above dataset (in Que 8).