Shri Vile Parle Kelavani Mandal's

Dwarkadas J. Sanghvi College of Engineering

(Autonomous College Affiliated to the University of Mumbai)

Scheme and detailed syllabus

Third Year B. Tech (DJS22)

Artificial Intelligence (AI) and Data Science

(Semester VI)

Shri Vile Parle Kelavani Mandal's
DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING
(Autonomous College Affiliated to the University of Mumbai)
NAAC Accredited with "A" Grade (CGPA : 3.18)

Proposed Scheme for Third Year Undergraduate Program in Artificial Intelligence (AI) and Data Science: Semester VI(Autonomous)
Academic Year (2024-25)

Sr. No.	Course Code	Course	Teaching Scheme(hrs)				Continuous Assessment (A) (marks)			Semester End Assessment (B) (marks)					Aggregate (A+B)	Total Credits
			Th	P	T	Credits	TH	T/W	Total CA (A)	Th	O	P	O &P	Total SEA (B)		
1	DJS22ADC601	Computer Vision	3	--	--	3	35	--	35	65	--	--	--	65	100	4
	DJS22ADL601	Computer Vision Laboratory	--	2	--	1	--	25	25	--	25	--	--	25	50	
2	DJS22ADC602	Deep Learning	3	--	--	3	35	--	35	65	--	--	--	65	100	4
	DJS22ADL602	Deep Learning Laboratory	--	2	--	1	--	25	25	--	--	--	25	25	50	
3	DJS22ADC603	Optimization Techniques	3	--	--	3	35	--	35	65	--	--	--	65	100	4
	DJS22ADL603	Optimization Techniques Laboratory	--	2	--	1	--	25	25	--	25	--	--	25	50	
4	DJS22ADL604	Big Data Laboratory	--	4	--	2	--	25	25	--	--	--	25	25	50	2
5@	DJS22ADC6011	MLOps	3	--	--	3	35	--	35	65	--	--	--	65	100	4
	DJS22ADL6011	MLOps Laboratory	--	2	--	1	--	25	25	--	25	--	--	25	50	
	DJS22ADC6012	Network Security and Cryptography	3		--	3	35	--	35	65	--	--	--	65	100	
	DJS22ADL6012	Network Security and Cryptography Laboratory		2	--	1	--	25	25	--	25	--	--	25	50	
	DJS22ADC6013	Computational Finance	3	--	--	3	35	--	35	65	--	--	--	65	100	
	DJS22ADL6013	Computational Finance Laboratory	--	2	--	1	--	25	25	--	25	--	--	25	50	
	DJS22ADC6014	Social Media Analytics	3	--	--	3	35	--	35	65	--	--	--	65	100	
	DJS22ADL6014	Social Media Analytics Laboratory	--	2	--	1	--	25	25	--	25	--	--	25	50	
6	DJS22IHL	Professional and Business Communication Laboratory		4*		2	--	50	50	--	--	--	--	--	50	2
7	DJS22ILLL2	Innovative Product Development IV	--	2	--	1	--	25	25	--	--	--	25	25	50	1
		Total	12	18	0	21	140	200	340	260	75	0	75	410	750	21

Th	Theory	T/W	Termwork
P	Practical	O	Oral
T	Tutorial		

Prepared by | Checked by | Head of the Department | Vice Principal | Principal

Continuous Assessment (A):

Course	Assessment Tools	Marks	Time (hrs.)
Theory	a. One Term test (based on 40 % syllabus)	35	1
	b. Second Term test (next 40 % syllabus) / presentation / assignment / course project / group discussion / any other.		
Audit course	Performance in the assignments / quiz / power point presentation / poster presentation / group project / any other tool.	--	As applicable
Laboratory	Performance in the laboratory and documentation.	25	
Tutorial	Performance in each tutorial & / assignment.	25	
Laboratory & Tutorial	Performance in the laboratory and tutorial.	25	

The final certification and acceptance of term work will be subject to satisfactory performance upon fulfilling minimum passing criteria in the term work / completion of audit course.

Semester End Assessment (B):

Course	Assessment Tools	Marks	Time (hrs.)
Theory / * Computer based	Written paper based on the entire syllabus.	65	3
	* Computer based assessment in the college premises.		
Oral	Questions based on the entire syllabus.	25	as applicable
Practical	Performance of the practical assigned during the examination and the output / results obtained.	25	2
Oral & Practical	Project based courses - Performance of the practical assigned during the examination and the output / results obtained. Based on the practical performed during the examination and on the entire syllabus.	As per the scheme	2

Program: B. Tech. in Artificial Intelligence (AI) and Data Science										Semester: VI			
Course: Computer Vision										Course Code: DJS22ADC601			
Course: Computer Vision Laboratory										Course Code: DJS22ADL601			
Teaching Scheme (Hours / week)				Evaluation Scheme									
				Semester End Examination Marks (A)			Continuous Assessment Marks (B)				Total Marks (A+ B)		
Lectures	Practical	Tutorial	Total Credits	Theory			Term Test 1	Term Test 2	Total				
				65			20	15	35		100		
				Laboratory Examination			Term work						
3	2	--	4	Oral	Practical	Oral & Practical	Laboratory Work	Tutorial / Mini project / presentation/ Journal	Total Term work		50		
				25	--	--	15	10	25				

Prerequisite: - Basic Mathematics & Image Processing

Course Objectives: The Objective of course is

1. To introduce foundational theories and computational methods related to Computer Vision
2. To equip students with practical skills in feature engineering and preprocessing techniques for images and video.
3. To develop competency in applying clustering, classification, and deep learning techniques to real-world computer vision problems.

Course Outcomes:

On completion of the course, learner will be able to

1. Understand foundational concepts of computer vision and apply geometric transformations
2. Analyze and implement feature detection and description techniques
3. Apply segmentation and detection methods for object recognition
4. Evaluate and apply clustering as well motion detection and optical flow algorithms
5. Implement and leverage deep learning models
6. Assess the Performance of Computer Vision Systems in Real-World Applications

Computer Vision (DJS22ADC601)		
Unit	**Description**	**Duration**
1	**Introduction to Computer Vision & Basic Transformations:** Image Formation Concepts, Radiometry, Geometric Transformations, Rotation, Translation, Scaling, Shearing, Combination of Transformations, Rigid & Affine Transformations	**08**
2	**Feature Detection & Description :** Interest or Corner Point Detectors- Harris and Hessian, Histogram of Oriented Gradients,GLOH, Scale Invariant Feature Transform(SIFT), Speeded up Robust Features(SURF), Saliency, Scale-Space Analysis- Image Pyramids	**08**
3	**Object Segmentation and Detection:** Edges-Canny Algorithm, DOG, RANSAC, ,DWT, Graph Technique, Mean-Shift, Distance metrics,Global Thresholding, Otsu Thresholding, Watershed Algorithm	**08**
4	**Clustering:** Clustering method for Segmentation-Hierarchical clustering methods for image segmentation, partitional Clustering Techniques: Fuzzy C-Means, K-Means **Motion analysis and Optical Flow:** Introduction to motion detection; Optical Flow (Lucas-Kanade, Horn-Schunck); Applications in motion analysis; Basics of tracking. Stereo from Motion	**07**
5	**Deep Learning Models for Computer Vision:** CNNs, AlexNet,VGG, InceptionNets, ResNets, DenseNets ,RNNs, R-CNNs; U-Net, Seg Net, Transfer Learning; YOLO; Attention Mechanism, Deep Generative Models: GANs	**04**
6	**Applications :** Gesture Recognition, Motion Estimation and Object Tracking, Pattern Classification, Semantic segmentation, Image Editing, Inpainting, Superresolution, 3D Object Generation	**04**
	TOTAL	**39**

Suggested List of Experiments

Computer Vision Laboratory (DJS22ADL601)	
Sr. No.	**Title of Experiment**
1	Image assessment with NumPy and OpenCV
2	Image Transformation in OpenCV
3	Feature Detection using OpenCV- Corner, Edge, Pyramid
4	Image Arithmetic Operations
5	Object Detection
6	Basic Video Processing in OpenCV
7	Object Tracking
8	Pattern Recognition
9	Face Recognition
10	Motion analysis and Action detection
11	Object Detection (CNN): Cancer Cells Detection using Medical Image Processing.
12	Object Detection (CNN): Comparative analysis of different CNN models on Image Dataset.
13	GAN: Deep fake Detection

14	Project Based Learning
15	Research Article Review

Minimum eight experiments from the above suggested list or any other experiment based on syllabus will be included, which would help the learner to apply the concept learnt

Books Recommended:

Textbooks:

1. Rafael C. Gonzalez, "Digital Image Processing", Pearson, 2018 Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, Bishop_book.pdf (uoi.https://www.cs.uoi.gr/~arly/courses/ml/tmp/Bishop_book.pdfgr)
2. 2. Richard Szeliski, Computer Vision Algorithms and Applications, The University of Washington,2022 (http://szeliski.org/Book/1stEdition.htm) for the 1st (2010) edition

Reference Books:

1. Introductory Techniques for 3D Computer Vision, Emanuele Trucco and Alessandro Verri, Prentice Hall,2015
2. Robot Vision, by B. K. P. Horn, MIT Press (Cambridge), 2024
3. Computer Vision: Algorithms and Applications, by Richard Szeliski (freely downloadable!),2010
4. Computer Vision: A Modern Approach, Forsyth and Ponce, Pearson Education,2015
5. Concise Computer Vision: An introduction in Theory and Algorithms by Dr. Reinhard Klette Learning OpenCV 5 Computer Vision with Python by Joseph Howse and Joe Minichino,2023

Web Links:

1.RobustReal-timeFaceDetection, https://www.cse.iitb.ac.in/~ajitvr/CS763_Spring2017/Adaboost_FaceDetection.pdf, paper by Viola and Jones, International Journal of Computer Vision (2004).

2. Best Books To Learn Open CV & Computer Vision in 2024 ,https://computingforgeeks.com/best-books-to-learn-opencv-computer-vision/#google_vignette

Online Courses:

1. Computer Vision and Image Processing – Fundamentals and Applicationshttps://onlinecourses.nptel.ac.in/noc22_ee48/preview/
2. Computer Vision,https://onlinecourses.nptel.ac.in/noc19_cs58/preview
3. Deep Learning for Computer Vision,https://onlinecourses.nptel.ac.in/noc21_cs93/preview
4. Computer Vision and Image Processing - Fundamentals and Applications,https://onlinecourses.nptel.ac.in/noc23_ee39/preview
5. Introduction to Computer Vision,https://www.coursera.org/learn/intro-computer-vision#modules

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper will be based on the entire syllabus summing up to 65 marks.
2. Total duration allotted for writing the paper is 2 hrs.

Laboratory:

Oral examination will be based on the entire syllabus including, the practical performed during laboratory sessions.

Continuous Assessment (B):

Theory:

1. One term test of 20 marks and one term test of 15 marks will be conducted during the semester
2. Total duration allotted for writing each of the paper is 1 hr.
3. Total of the marks scored in both the two tests will be considered for final grading.

Laboratory: (Term work)

The distribution of marks for term work shall be as follows:

i. Laboratory work (Performance of Experiments): 15 marks
ii. Mini Project/Journal Documentation (Write-up and Assignments): 10 marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

Prepared by | Checked by | Head of the Department | Vice Principal | Principal

Syllabus for Third Year B. Tech Program in Artificial Intelligence (AI) and Data Science
Semester VI (Autonomous)

Program: B.Tech. in Artificial Intelligence (AI) and Data Science	Semester: VI
Course: Deep Learning	Course Code: DJS22ADC602
Course: Deep Learning Laboratory	Course Code: DJS22ADL602

Teaching Scheme (Hours / week)				Evaluation Scheme						
				Semester End Examination Marks (A)			Continuous Assessment Marks (B)			Total marks (A+ B)
Lectures	Practical	Tutorial	Total Credits	Theory			Term Test 1	Term Test 2	Total	
				65			20	15	35	100
				Laboratory Examination			Term work		Total Term work	50
3	2	--	4	Oral	Practical	Oral & Practical	Laboratory Work	Tutorial / Mini project / presentation/ Journal		
				--	--	25	15	10	25	

Prerequisite: Linear Algebra, Calculus, Probability, Statistics and Machine Learning Basics.

Course Objectives: The Objective of course is

1. To introduce fundamental concepts of artificial neural network and different learning algorithms: supervised and unsupervised neural networks
2. Develop in-depth understanding of the key techniques in designing Deep Network and GAN.
3. To expose Deep Network based methods to solve real world complex problems.
4. To explore applications and challenges in deep learning

Outcomes: Students will be able to

1. Understand the fundamentals of deep neural networks and their training mechanisms.
2. Apply optimization and regularization techniques to improve model performance.
3. Design and implement CNN models for supervised learning tasks.
4. Develop solutions for sequence learning applications using recurrent networks.
5. Analyze unsupervised learning techniques for dimensionality reduction and data reconstruction.
6. Evaluate recent trends in adversarial networks and generative models.

Deep Learning (DJS22ADC602)		
Unit	**Description**	**Duration**
1	**Supervised Learning Networks** **Feedforward DNN** Perceptron: Representational power of Perceptron, The Perceptron Training Rule, Multilayer perceptron: Delta training rule; Multilayer Networks: A differentiable Threshold Unit (Sigmoid Neurons), Representational Power of Feedforward Networks; Activation functions: Tanh, Logistic, Linear, Softmax, ReLU, Leaky ReLU, Loss functions: Squared Error loss, Cross Entropy, Choosing output function and loss function	07
2	**Optimization** Learning with backpropagation: EBPTA, Learning Parameters: Gradient Descent (GD), Stochastic and Mini Batch GD, Momentum Based GD, Nesterov Accelerated GD, AdaGrad, Adam, RMSProp, Convergence and local minima, stopping criteria. **Regularization:** Regularization for Deep Learning: Parameter Norm Penalties, Dataset Augmentation, Noise Robustness, Early Stooping, Sparse Representation, Dropout.	07
3	**Convolutional Neural Networks:** Convolution operation, Padding, Stride, Relation between input, output and filter size, CNN architecture: Convolution layer, Pooling Layer, Weight Sharing in CNN, Fully Connected NN vs CNN, Variants of basic Convolution function, 2D Convolution **ConvNet Architectures:** LeNet: Architecture, AlexNET: Architecture, ResNet : Architecture, ConvNeXt, EfficientNET, Applications: object detection and recognition tasks, medical image analysis, image classification	06
4	**Sequence Modelling:** Sequence Learning Problem, Unfolding Computational graphs, Recurrent Neural Network, Bidirectional RNN, Backpropagation Through Time (BTT), Limitation of "vanilla RNN", Vanishing and Exploding Gradients, The Long Short-Term Memory, GRU, Deep recurrent Networks. Applications: Sentiment analysis, stock prices or market trends	06
5	**Unsupervised Learning Networks:** Kohonen Self-Organizing Feature Maps – architecture, training algorithm. **Autoencoders:** Introduction, comparison with PCA, Linear Autoencoder, Undercomplete Autoencoder, Overcomplete Autoencoders, Regularization in Autoencoders, Denoising Autoencoders, Sparse Autoencoders, Contractive Autoencoders, Variational Autoencoders (VAEs) Applications: image compression, feature extraction, risk assessment and fraud detection	07
6	**Adversarial Networks** Generative Vs Discriminative Modeling, Generative Adversarial Networks (GAN) Architecture, GAN challenges: Oscillation Loss, Mode Collapse, Uninformative Loss, Hyperparameters, Tackling GAN challenges, Wasserstein GAN, Cycle GAN, Neural Style Transfer Diffusion Models: Introduction, Comparison with GANs Applications: image synthesis or style transfer, Data Augmentation	06
	TOTAL	39

Suggested List of Experiments: -

Deep Learning Laboratory (DJS22ADL602)	
Sr. No.	**Title of the Experiment**
1	Implement Boolean gates using perceptron.
2	Implement representation power of perceptron.
3	Implement backpropagation algorithm from scratch.
4	Train CNN Models for Image Classification Tasks.
5	Evaluate the Effect of Optimizers (SGD, Adam) on Model Performance.
6	Compare the Performance of PCA and Autoencoders on Dimensionality Reduction Tasks.
7	Sequence Classification Using RNN or GRU (e.g., Sentiment Analysis or Activity Recognition).
8	Anomaly detection using Self-Organizing Network.
9	Compare the performance of PCA and Autoencoders on a given dataset.
10	Train Variational Autoencoders (VAEs) for Image Reconstruction.
11	Build Generative adversarial model for fake (news/image/audio/video) prediction.
12	Generate Synthetic Data Using Diffusion Models and Evaluate Results.
13	Mini Project

Minimum eight experiments and mini project from the above suggested list or any other experiment based on syllabus will be included, which would help the learner to apply the concept learnt.

Books Recommended:
Textbooks:

1. Dive into Deep Learning: Asaton Zhang, Zhacary Lipton, Mu Li and Alex Smola, December 2023
2. Understanding Deep Learning, Simon Prince, MIT Press, Dec2023
3. Simon Haykin, "Neural Networks and Learning Machines", Pearson Prentice Hall, 3rd Edition, 2010.
4. S. N. Sivanandam and S. N. Deepa, "Introduction to Soft Computing", Wiley India Publications, 3rd Edition, 2018.
5. M. J. Kochenderfer, Tim A. Wheeler. —Algorithms for Optimizationl, MIT Press.
6. David Foster, "Generative Deep Learning", O'Reilly Media, 2019.
7. Denis Rothman, "Hands-On Explainable AI (XAI) with python", Packt, 2020.

Reference Books:

1. Ian Goodfellow and Yoshua Bengio and Aaron Courville, "Deep Learning", An MIT Press, 2016
2. François Chollet, "Deep Learning with Python", Manning Publication, 2017.
3. Josh Patterson, Adam Gibson, "Deep Learning: A Practitioner's Approach", O'Reilly Publication, 2017.
4. Andrew W. Trask, Grokking, "Deep Learning", Manning Publication, 2019.
5. John D. Kelleher, "Deep Learning", MIT Press Essential Knowledge series, 2019.
6. Douwe Osinga. —Deep Learning Cookbookl, O'REILLY, SPD Publishers, Delhi

Web Resources:

1. Deep Learning: https://vlab.spit.ac.in/ai/#/experiments
2. Deep learning book https://www.deeplearningbook.org/
3. Deep learning all videos: https://www.cse.iitm.ac.in/~miteshk/CS6910.html
4. Deep Learning Specialization: https://www.coursera.org/specializations/deep-learning

Online Resources

1. Deep Learning, IIT Ropar NPTEL course by Prof. Sudarshan Iyengar,Dr. Padmavati https://nptel.ac.in/courses/106106184.

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper will be based on the entire syllabus summing up to 65 marks.
2. Total duration allotted for writing the paper is 2 hrs.

Laboratory:

Oral & Practical examination will be based on the entire syllabus including, the practical performed during laboratory sessions.

Continuous Assessment (B):

Theory:

1. One term test of 20 marks and one term test of 15 marks will be conducted during the semester
2. Total duration allotted for writing each of the paper is 1 hr.
3. Total of the marks scored in both the two tests will be considered for final grading.

Laboratory: (Term work)

The distribution of marks for term work shall be as follows:

i. Laboratory work (Performance of Experiments): 15 marks
ii. Mini project / Journal Documentation (Write-up and Assignments): 10 marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work

Prepared by | Checked by | Head of the Department | Vice Principal | Principal

Syllabus for Third Year B. Tech Program in Artificial Intelligence (AI) and Data Science
Semester VI (Autonomous)

Program: B. Tech. in Artificial Intelligence (AI) and Data Science											Semester: VI	
Course: Optimization Techniques											Course Code: DJS22ADC603	
Course: Optimization Techniques Laboratory											Course Code: DJS22ADL603	
Teaching Scheme (Hours / week)				Evaluation Scheme								
				Semester End Examination Marks (A)			Continuous Assessment Marks (B)				Total Marks (A+ B)	
Lectures	Practical	Tutorial	Total Credits	Theory			Term Test 1	Term Test 2	Total			
				65			20	15	35		100	
				Laboratory Examination			Term work					
3	2	--	4	Oral	Practical	Oral & Practical	Laboratory Work	Tutorial / Mini project / presentation/ Journal	Total Term work		50	
				25	--	--	15	10	25			

Prerequisite: Mathematics Concepts, Machine Learning.

Course Objectives: The Objective of course is

1. To introduce basic understanding of optimization techniques and its applications
2. To equip students with Significance of optimization techniques in data science
3. To develop numerical techniques of optimization theory to solve concrete Engineering problems

Course Outcomes:

On completion of the course, learner will be able to

1. Understand basics of Optimization methods
2. Apply Linear Programming Techniques for Optimization
3. Solve Transportation Problems with various methods
4. Apply Optimization for assignment problems
5. Implement various Optimization Methods for ML
6. Implement various Optimization Methods for DL

Optimization Techniques (DJS22ADC603)		
Unit	**Description**	**Duration**
1	**Overview of Optimization in Data Science:** Importance of optimization in machine learning and deep learning, Types of optimization problems: linear, nonlinear, convex, non-convex, Objective functions, constraints, and feasible regions, Local vs. global minima, Unconstrained vs. constrained optimization	08

2	**Linear Programming:** Introduction, Maximization, Minimization, Graphical Method, Simplex Method, Duality, Big M Method, Two Phase Simplex Method, Primal vs Dual, Simulation Modelling: Monte Carlo Method	08
3	**Transportation Problem**: Introduction, Mathematical Model, Balanced and Unbalanced Problem, Northwest Corner Rule, Stepping Stone Method, Vogel Approximation Method, MODI Method, Optimality Criteria, Traveling Salesman Problem	08
4	**Assignment Problem:** Introduction, Mathematical Model, Cost Minimization Model, Profit Maximization Model, Hungarian Method, Optimality Criteria, Traveling Salesman Problem, Critical Path Analysis	07
5	**Convex Optimization:** Convex Functions, First and Second Order Conditions for Optimisations, Convex and Non Convex Optimisation problems	04
6	**Optimization Methods in ML/DL:** Variants of Gradient Descent: (Projected, Stochastic, Proximal, Accelerated, Coordinate Descent) Newton's Method	04
	TOTAL	39

Suggested List of Experiments

Optimization Techniques Laboratory (DJS22ADL603)	
Sr. No.	**Title of Experiment/ Tutorial**
1	Linear Programming with SciPy
2	Big M Method in Linear Programming
3	Graphical Method and Simplex Method in Linear Programming
4	Monte Carlo Simulation for Optimization
5	Transportation Problem
6	Assignment Problem with Hungarian Method
7	Solving Traveling Salesman Problem (TSP)
8	Critical Path Analysis for Project Scheduling
9	Gradient-Based Optimization Techniques in Machine Learning
10	Convex Optimization
11	Variants of Gradient Descent: Projected, Stochastic, Proximal, Accelerated, Coordinate Descent
12	Applications to logistics, manufacturing, transportation, marketing, project management, and finance(Case Study)
13	Project Based Learning
14	Research Article Review

Minimum eight experiments/tutorials from the above suggested list or any other experiment based on syllabus will be included, which would help the learner to apply the concept learnt

Books Recommended:

Textbooks:

1. Boyd, Stephen, and Lieven Vandenberghe. Convex optimization. Cambridge university press, 2014.

2. Yurii, Nesterov, Introductory lectures on convex optimization: a basic course. Kluwer Academic Publishers, 2019.
3. Bernard W. Taylor III, Introduction to Management Science, 13th Edition, Pearson, 2013
4. J.K. Sharma, Operations Research: Theory and Applications, 6th edition, MacMillan, 2017

Reference Books:

1. Luenberger, D. G., and Y. Ye. Linear and nonlinear programming, Springer New York, 2008.
2. Nocedal, Jorge, and Stephen Wright. Numerical optimization. Springer Science & Business Media, 2006.
3. Prem Kumar Gupta and D S Hira, Operations Research, Revised edition, Sultan Chand Publications, 2017
4. Hamdy D Taha, Operations Research, 8th edition, Prentice Hall, 2017
5. S S Rao, Engineering Optimization, 3rd edition, Prentice Hall, 2017

Web Links:

1. Algorithms for Optimization, https://algorithmsbook.com/optimization/files/optimization.pdf
2. Computational Intelligence, https://staff.fmi.uvt.ro/~daniela.zaharie/ma2017/books/Computational%20Intelligence%20An%20Introduction%20-%20Andries%20P.%20Engelbrecht.pdf

Online Courses:

1. Optimization for Machine Learning: Theory and Implementation (Hindi).https://onlinecourses.nptel.ac.in/noc23_cs64/preview
2. Optimization Theory and Algorithms, https://onlinecourses.nptel.ac.in/noc24_ee122/preview
3. Data Science for Engineers, https://onlinecourses.nptel.ac.in/noc21_cs69/preview

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper will be based on the entire syllabus summing up to 65 marks.
2. Total duration allotted for writing the paper is 2 hrs.

Laboratory:

Oral examination will be based on the entire syllabus including, the practical performed during laboratory sessions.

Continuous Assessment (B):

Theory:

1. One term test of 20 marks and one term test of 15 marks will be conducted during the semester
2. Total duration allotted for writing each of the paper is 1 hr.
3. Total of the marks scored in both the two tests will be considered for final grading.

Laboratory: (Term work)

The distribution of marks for term work shall be as follows:

i. Laboratory work (Performance of Experiments): 15 marks
ii. Mini project / Journal Documentation (Write-up and Assignments): 10 marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

Prepared by | Checked by | Head of the Department | Vice Principal | Principal

Program: B.Tech. in Artificial Intelligence (AI) & Data Science				Semester : VI						
Course : Big Data Laboratory				Course Code: DJS22ADL604						
Teaching Scheme (Hours / week)				Evaluation Scheme						
				Semester End Examination Marks (A)			Continuous Assessment Marks (B)			Total marks (A+ B)
Lectures	Practical	Tutorial	Total Credits	Theory			Term Test 1	Term Test 2	Avg.	
				--			--	--	--	--
				Laboratory Examination			Term work		Total Term work	50
--	4	--	2	Oral	Practical	Oral & Practical	Laboratory Work	Tutorial / Mini project / presentation/ Journal		
				--	--	25	15	10	25	

Prerequisite: Databases, Python, R, Linux OS

Course Objectives: The Objective of course is

1. To define big data solutions for business intelligence & analyses business case studies for big data analytics.
2. To develop map-reduce analytics using Hadoop and data storage and management using NoSql.
3. To perform real-time analysis on streaming data.
4. To develop a comprehensive understanding of data visualization principles and techniques using Tableau and Power BI.
5. To acquire hands-on experience in creating interactive and effective visualizations for various data sets.

Outcomes: Students will be able to

1. Describe big data and use cases from selected business domains.
2. Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data Analytics
3. Build and maintain reliable, scalable, distributed systems using Apache Spark.
4. Design and build MongoDB based Big Data Applications and learn MongoDB query language.
5. Demonstrate proficiency in using Tableau and Power BI to create visually compelling and interactive data visualizations on complex data sets
6. Communicate data-driven insights and stories through visually engaging presentations using Tableau and Power BI.

Syllabus for Third Year B.Tech Program in Artificial Intelligence & Data Science
Semester VI (Autonomous)

Unit	Description	Duration
1	**Introduction to Big Data and Hadoop** Introduction to Big Data, Big Data characteristics, Drivers, types of Big Data, Case Study of Big Data Solutions , Bigdata Applications Societal and Ethical issues associated with the use of big data analytics Big Data – Apache Hadoop & Hadoop EcoSystem Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce Concept of Hadoop HDFS Commands, MApReduce-The Map Tasks, Grouping by Key, The Reduce Tasks, Combiners, Details of MapReduce Execution	08
2	**HDFS, HIVE AND HIVEQL, HBASE** HDFS-Overview, Installation and Shell, Java API; Hive Architecture and Installation, Comparison with Traditional Database, HiveQL Querying Data, Sorting And Aggregating, HBase concepts, Advanced Usage, Schema Design, Advance Indexing, PIG-Grunt pig data model Pig Latin developing and testing Pig Latin scripts Zookeeper , how it helps in monitoring a cluster Build Applications with Zookeeper and HBase	08
3	**NoSQL** **Relational vs NoSQL Data Sore** Types of NoSQL Stores: Document based, Key-value based, Column Based, Graph based.	10
4	**SPARK:** Introduction to Data Analysis with Spark, Downloading Spark and Getting Started, Programming with RDDs, Machine Learning with MLlib. **Processing of Real Time Data and Streaming Data:** Data Streams: Introduction and Ingestion, Kafka, Storm & Storm Assignment, Spark Streaming	10
5	**Introduction to Data Visualization and Tools:** Understanding the fundamentals of data visualization Introduction to Tableau and Power BI Exploring the user interface and features of Tableau and Power BI Data cleaning and transformation for visualization Choosing appropriate chart types for different data scenarios Creating interactive visualizations using Tableau and Power BI	08
6	**Advanced Visualization and Dashboard Design:** Advanced chart types and visualization techniques Designing effective dashboards for data exploration and presentation Applying best practices for visual storytelling in Tableau and Power BI	08
	TOTAL	52

Suggested List of Experiments:

Big Data Laboratory (DJS22ADL604)	
Sr. No.	**Title of the Experiment**
1	Installation of Hadoop on a single node cluster
2	Execution OF HDFS Commands.
3	Execution of MapReduce program for sorting of numbers and counting word occurrences in a text file.
4	Execute HIVE commands to load, insert, retrieve, update, or delete data in the tables.
5	Execute PIG built in commands and run pig scripts on HDFS
6	Installation and Configuration of Apache Spark. Execution of ML algorithms using Apache Spark Mlib
7	Perform CRUD Operations using a Graph based Data Store
8	Perform CRUD Operations using a Document based Data Store
9	Read streaming data using Kafka.
10	Perform Twitter Sentiment analysis using Spark Streaming
11	Creating an interactive drill-down dashboard to explore sales data by product categories using Tableau. Also visualize using scatter plot, stacked area chart, barchart, waterfall chart Etc.
12	Depict time-series data trends in Power BI and visualize using various charts.
13	Creating a geographic map visualization to display regional sales using Power BI.
14	Designing a heat map,treemap to visualize customer engagement patterns in Power BI.
15	Designing an interactive dashboard with filters and parameters to visualize survey responses using Power BI.
16	Miniproject

Books Recommended:

Text Books

1. Understanding Big data - Chris Eaton,Dirk derooset al. McGraw Hill,2012.
2. MongoDB in Action - Kyle Banker,Piter Bakkum, Shaun Verch, Dream tech Press,2016.
3. Beginning Apache Pig-Big Data Processing Made Easy-Balaswamy Vaddeman, Apress',2016.
4. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley,2012.
5. Eric Sammer, "Hadoop Operations", Reilly,2012.

Reference Books

1. Paul Zikopoulos, Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Understanding *Big Data: Analytics for Enterprise Class Hadoop and streaming Data*,The McGraw-Hill Companies, 2012.
2. Vignesh Prajapati, Big data analytics with R and Hadoop, SPD 2013.
3. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
4. Alan Gates, "Programming Pig", O'Reilley, 2011

Web Resources:

1. Tableau Tutorial for Beginners in 20 Minutes | Complete Tableau Training for Beginners | Simplilearn - YouTube
2. Power BI Full Course | Power BI Tutorial For Beginners | Power BI Course | Simplilearn - YouTube
3. Power BI Tutorial (tutorialspoint.com)
4. Tableau Tutorial (tutorialspoint.com)
5. https://onlinecourses.nptel.ac.in/noc20_cs92/preview
6. https://www.coursera.org/professional-certificates/ibm-data-analyst
7. https://www.coursera.org/specializations/big-data

Online Recourses:

- Big Data Computing https://onlinecourses.nptel.ac.in/noc20_cs92/preview
- Google Data Analytics Professional Certificate, https://www.coursera.org/professional-certificates/google-data-analytics
- NoSQL, Big Data, and Spark Foundations Specialization, https://www.coursera.org/specializations/nosql-big-data-and-spark-foundations

Evaluation Scheme:

Laboratory:

Oral and practical examination will be based on the entire syllabus of practical performed during laboratory sessions of course.

Continuous Assessment (B):

Laboratory: (Term work)

The distribution of marks for term work shall be as follows:

i. Laboratory work (Performance of Experiments): 15 marks
ii. Mini Project / Journal Documentation (Write-up and Assignments): 10 Marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

Prepared by Checked by Head of the Department Vice Principal Principal

Syllabus for Third Year B. Tech Program in Artificial Intelligence (AI) and Data Science
Semester VI (Autonomous)

Program: B.Tech. in Artificial Intelligence (AI) and Data Science										Semester: VI		
Course: MLOps										Course Code: DJS22ADC6011		
Course: MLOps Laboratory										Course Code: DJS22ADL6011		
Teaching Scheme (Hours / week)				Evaluation Scheme								
				Semester End Examination Marks (A)			Continuous Assessment Marks (B)				Total marks (A+ B)	
Lectures	Practical	Tutorial	Total Credits	Theory			Term Test 1	Term Test 2		Total		
				65			20	15		35	100	
				Laboratory Examination			Term work			Total Term work	50	
3	2	--	4	Oral	Practical	Oral & Practical	Laboratory Work	Tutorial / Mini project / presentation / Journal				
				25	--	--	15	10		25		

Prerequisite:

1. Knowledge of Linux Operating system, installation and configuration of services and command line basics
2. Basics of Machine Learning
3. Knowledge Development Life cycle, development frameworks and DevOps

Course Objectives: The Objective of course is

1. The objective of this course is to understand the fundamentals of MLOps and its significance in the ML lifecycle.
2. Students will learn various tools and technologies used in MLOps to design and build scalable ML pipelines.
3. Students will get exposure to deploy ML models.
4. Students will learn techniques for monitoring, debugging, and optimizing ML systems.
5. Finally, students will explore methods for reproducibility, version control, and model governance.

Outcomes: On completion of the course, the learner will be able to:

1. Understand the Fundamentals of MLOps and Its Role in ML Lifecycle Management.
2. Develop Skills in Data and Model Management for Reproducibility and Scalability.
3. Build and Automate ML Model Training Pipelines.
4. Implement Model Deployment and Serving Strategies Using CI/CD.
5. Monitor and Optimize ML Model Performance and Infrastructure.
6. Apply Governance, Compliance, and Security Principles in MLOps.

MLOps (DJS22ADC6011)		
Unit	**Description**	**Duration**
1	**Introduction to Machine Learning Operations** Overview of MLOps and its importance, Understanding the challenges in deploying and managing ML models, ML development lifecycle, Role of MLOps in the ML development lifecycle, Introduction to DevOps and its application to ML, MLOps in Practice.	07
2	**Data Management, Model Development and Training for MLOps** Model Development and Training for MLOps, Data versioning and reproducibility, Data preprocessing and feature engineering pipelines, Data validation and monitoring, Data quality assurance and governance, Model versioning and tracking, Model training pipelines and automation, Hyperparameter tuning and model selection, Model evaluation and validation techniques	08
3	**Model Deployment and Serving, Continuous Integration and Delivery (CI/CD) for ML** Model packaging and containerization (e.g., Docker), Infrastructure provisioning and orchestration (e.g., Kubernetes), Deploying models as scalable services, managing model endpoints and versioning, Version control and collaboration (e.g., Git), Building reproducible ML pipelines, Automated testing and code quality checks, Continuous integration and deployment strategies.	06
4	**Monitoring and Performance Optimization** Monitoring model performance and behavior, Real-time and batch monitoring techniques, Logging and error tracking in ML systems, Performance optimization and scalability considerations.	06
5	**Cloud Platforms and Infrastructure for MLOps** Introduction to cloud platforms (e.g., AWS, Azure, GCP) key services of each platform, Deploying ML models on cloud infrastructure, managing resources and scaling ML workloads, Cost optimization strategies for ML systems.	08
6	**Governance and Compliance in MLOps** Data privacy and protection in ML systems, Access control and authentication mechanisms, Security considerations for model deployment, Compliance with industry regulations (e.g., GDPR, HIPAA).	04
	TOTAL	39

Suggested List of experiments:

MLOps Laboratory(DJS22ADL6011)	
Sr. No.	**Title of the Experiment**
1	**Case Studies and Best Practices** a. Real-world MLOps case studies b. Best practices and lessons learned c. Industry trends and emerging technologies in MLOps d. Future directions and challenges in the field
2	**Setting up a Version Control System (VCS) for ML Projects:** a. Experiment with popular VCS tools like Git and create a repository for ML projects. b. Learn to track code changes, collaborate with team members, and manage different branches.
3	**Creating a Continuous Integration (CI) Pipeline:** a. Build a CI pipeline using tools like Jenkins, Travis CI, or GitLab CI. b. Automate the process of building, testing, and validating ML models with each code commit.
4	**Containerization with Docker:** a. Containerize ML models and their dependencies using Docker. b. Experiment with Docker images, containers, and Dockerfile configurations.
5	**Orchestrating ML Workflows with Kubernetes:** a. Deploy ML models as scalable and resilient services using Kubernetes. b. Experiment with deploying, managing, and scaling ML workloads in Kubernetes clusters.
6	**Experiment Tracking and Management:** a. Use tools like MLflow or Neptune.ai to track experiments, log metrics, and manage model versions. b. Explore features like hyperparameter tuning, model registry, and experiment reproducibility.
7	**Continuous Deployment (CD) for ML Models:** a. Implement a CD pipeline to automate the deployment of ML models to production. b. Deploy an ML model for image classification using AWS SageMaker.
8	**Monitoring and Alerting:** a. Set up monitoring and alerting systems to track model performance, data drift, and anomalies. b. Experiment with tools like Prometheus, Grafana, or DataDog to visualize and monitor ML system metrics.
9	**Model Performance Optimization:** a. Explore techniques for optimizing model performance, such as model quantization, pruning, or distillation. b. Experiment with different optimization approaches and measure their impact on model efficiency.
10	**A/B Testing and Experimentation:** a. Design and conduct A/B tests to compare the performance of different ML models or algorithms. b. Experiment with statistical analysis and hypothesis testing to evaluate model improvem

	understand the importance of model governance and compliance in regulated industries. c. Experiment with model explainability, bias detection, and fairness assessment techniques.
11	**Infrastructure as Code (IaC) for ML**: a. Use tools like Terraform or AWS CloudFormation to manage ML infrastructure. Experiment with provisioning and automating the setup of ML environments.

Minimum eight experiments from the above suggested list or any other experiment based on syllabus will be included, which would help the learner to apply the concept learnt

Books Recommended:

Textbooks:

1. Noah Gift , "Practical MLOps: A Guide to Building Real-World Machine Learning Systems", O'Reilly, First Edition, September 2021.
2. Mark Treveil, Nicolas Omont, "Introducing MLOps: How to Scale Machine Learning in the Enterprise", O'Reilly Media, First Edition, January 5, 2021
3. Emmanuel Raj, "Engineering MLOps: Rapidly build, test, and manage production-ready machine learning life cycles at scale", Packt Publishing Limited, 1st edition, 19 April 2021

Reference Books:

1. Hannes Hapke and Catherine Nelson, "Building Machine Learning Pipelines: Automating Model Life Cycles with TensorFlow", O'Reilly, First Edition, 19 July 2020.
2. Chris Fregly, Antje Barth, "Data Science on AWS: Implementing End-to-End Continuous Machine Learning Pipelines", O'Reilly, First Edition, 9 May 2021.
3. Sridhar Alla, Suman Kalyan Adari, "Beginning MLOps with MLFlow: Deploy Models in AWS SageMaker, Google Cloud, and Microsoft Azure", Apress publication, 1st edition, 8 December 2020.

Web Link:

1. Machine Learning Operations, https://ml-ops.org/
2. MLOps: Continuous delivery and automation pipelines in machine learning, https://cloud.google.com/architecture/mlops-continuous-delivery-and-automation-pipelines-in-machine-learning
3. Why You Need MLOps, https://www.run.ai/guides/machine-learning-operations

Online Courses:

1. MLOps | Machine Learning Operations Specialization, https://www.coursera.org/specializations/mlops-machine-learning-duke
2. Machine Learning in Production, https://www.coursera.org/learn/introduction-to-machine-learning-in-production
3. Machine Learning Operations (MLOps): Getting Started,https://www.coursera.org/learn/mlops-fundamentals

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper will be based on the entire syllabus summing up to 65 marks.

2. Total duration allotted for writing the paper is 2 hrs.

Laboratory:

Oral & Practical examination will be based on the entire syllabus including, the practical performed during laboratory sessions.

Continuous Assessment (B):

Theory:

1. One term test of 20 marks and one term test of 15 marks will be conducted during the semester
2. Total duration allotted for writing each of the paper is 1 hr.
3. Total of the marks scored in both the two tests will be considered for final grading.

Laboratory: (Term work)

The distribution of marks for term work shall be as follows:

I. Laboratory work (Performance of Experiments): 15 marks
II. Mini project / Journal Documentation (Write-up and Assignments): 10 marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

Prepared by Checked by Head of the Department Vice Principal Principal

Syllabus for Third Year B. Tech Program in Artificial Intelligence (AI) and Data Science
Semester VI (Autonomous)

Program: B. Tech. in Artificial Intelligence (AI) and Data Science	Semester: VI
Course: Network Security and Cryptography	Course Code: DJS22ADC6012
Course: Network Security and Cryptography Laboratory	Course Code: DJS22ADL6012

Teaching Scheme (Hours / week)				Evaluation Scheme						
				Semester End Examination Marks (A)			Continuous Assessment Marks (B)			Total Marks (A+ B)
Lectures	Practical	Tutorial	Total Credits	Theory			Term Test 1	Term Test 2	Total	
				65			20	15	35	100
				Laboratory Examination			Term work		Total Term work	50
3	2	--	4	Oral	Practical	Oral & Practical	Laboratory Work	Tutorial / Mini project / presentation/ Journal		
				25	--	--	15	10	25	

Prerequisite:

1. Computer Networks

Objectives: The Objective of course is

1.To introduce Basics of Network security.

2.To perform various attacks on the network security.

3.To gain the knowledge of different networking protocols.

4.To understand the firewall and IDS for system security

Outcomes: On completion of the course, learner will be able to:

1.Understand the basics of Network Security.

2.Learn the basics of Cryptography.

3.Implement different Key Management and Authentication.

4.Explore Security at Network and Transport Layer.

5.Analyze different Non-Cryptographic Protocol Vulnerabilities.

6.Identify the function of an IDS and firewall for the system security

Network Security and Cryptography (DJS22ADC6012)		
Unit	**Description**	Duration
1	**Introduction** Common Attacks and Vulnerabilities, Defence Strategies and Techniques: Access Control, Data Protection, Prevention and Detection, Response, Recovery and Forensics **Basics of Cryptography:** Preliminaries, Elementary Substitution Ciphers, Elementary Transposition Ciphers, Other Cipher Properties, DES construction.	**4**
2	**Cryptography** RSA Operations, Why Does RSA Work?, Performance, Applications and practical Issues, Public Key Cryptography Standard, Diffie-Hellman Key Exchange **Cryptographic Hash:** Introduction, Properties, Construction, Applications and Performance, The Birthday Attack.	**7**
3	**Key Management and Authentication** Introduction, Digital Certificates, Public Key Infrastructure, Identity-based Encryption. **Authentication:** One-way Authentication, Mutual Authentication, Dictionary attacks, Centralised Authentication, The Needham-Schroeder Protocol, Kerberos, Biometrics	**10**
4	**Security at the Network Layer and Transport Layer** Security at different Layers: Pros and Cons, IPSec, Internet Key Exchange (IKE) Protocol, Security Policy and IPSec, Virtual Private Networks, Introduction to Security at Transport Layer, SSl Handshake Protocol, SSL Record Layer Protocol, Open SSL.	**5**
5	**Non-Cryptographic Protocol Vulnerabilities** DoS and DDoS, Session Hijacking and Spoofing, Pharming Attacks, Wireless Lan Vulnerabilities **Software Vulnerabilities:** Phishing, Buffer Overflow Format String Attacks, Cross-site Scripting (XSS), SQL Injection.	**7**
6	**Malwares, Firewalls and Intrusion Prevention and Detection** Preliminaries: Viruses, Worms and other Malwares, features, Internet Scanning Worms, Topological Worms, Web Worms, Mobile Malware, Botnets **Firewalls:** Basics, Functionalities, Policies and Types, Practical Issues **Intrusion Prevention and Detection:** Introduction, Prevention Versus Detection, Types of Intrution Detection System, DDoS Attack Prevention/Detection, Malware Detection.	**6**
TOTAL		**39**

List of Laboratory Experiments:

Network Security and Cryptography Laboratory (DJS22ADL6012)	
Sr. No	**Experiment**
1	Study and Implement OS Security
2	Study and Implement Buffer Overflow
3	Study and Implement SQL Injection
4	Study and Implement Cross Site Scripting
5	Study and Implement DOS Attacks
6	Study and Implement Session Hijacking Attacks
7	Study and Implement VPN
8	Study and Implement PGP/GPG Encryption
9	Study and Implement Firewalls using iptables
10	Study and Implement IDS
11	Study and Implement Network traffic sniffing (Wireshark, Ettercap)
12	Case Study on Cloud Security

Books Recommended:

Textbooks:

1.William Stallings, Cryptography and Network Security, Pearson Publication, 7th Edition, 2017.

2.Charles P. Pfleeger "Security in computing", Pearson Education, 5th Edition, 2018.

3.Behrouz A. Forouzan "Introduction to Cryptography and Network Security", McGraw-Hill, 3rd Edition, 2015.

4. Cryptography, Network Security, and Cyber Laws, CENGAGE Learning, 1st Edition, 2018.

Reference Books:

1.Practical Packet Analysis: Using Wireshark to Solve Real-Word Network problems by Chris Sanders. 3rd Editon, 2017.

2.Man Ho Au, Raymond Choo, Mobile Security and Privacy: Advances, Challenges and Future Research Directions, 1st Edition, 2016.

3.Roberta Bragg (Author), Mark Rhodes-Ousley (Author), Keith Strassberg (Author) Network Security: The Complete Reference, 1 July 2017

Web Resources:

1.Network World - https://www.networkworld.com/asia/
2.Course on - Palo Alto Networks Cybersecurity Professional Certificate- https://www.coursera.org/professional-certificates/palo-alto-networks-cybersecurity-fundamentals
3.SecurityTube - http://www.securitytube.net/
4.Reddit- https://www.reddit.com/r/netsec/

5.Network Security- https://www.mygreatlearning.com/academy/learn-for-free/courses/network- security

Online Courses:

1.Cryptography and Network Security By Prof. Sourav Mukhopadhyay, IIT Kharagpur-https://onlinecourses.nptel.ac.in/noc21_cs16/preview
2.Cyber Security By Dr.G.PADMAVATHI, Avinashilingam Institute for Home Science & Higher Education for Women, Coimbatore, https://onlinecourses.swayam2.ac.in/cec20_cs15/preview
3.Information Security: A Hands-On Approach: https://nptel.ac.in/courses/106/106/106106229/

Evaluation Scheme:

Semester End Examination (A):

Theory:

1.Question paper will be based on the entire syllabus summing up to 75 marks.

2.Total duration allotted for writing the paper is 3 hrs.

Laboratory:

Oral examinations will be based on the entire syllabus including the practical's performed during laboratory sessions.

Continuous Assessment (B):

Theory:

1. One term test of 20 marks and one term test of 15 marks will be conducted during the semester
2. Total duration allotted for writing each of the paper is 1 hr.
3. Total of the marks scored in both the two tests will be considered for final grading.

Laboratory: (Term work)

I. Laboratory work (Performance of Experiments): 15 Marks

ii. Mini Project / Journal documentation (Assignments): 10 marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work, and upon fulfilling minimum passing criteria in the term work.

Prepared by Checked by Head of the Department Vice Principal Principal

Program:B. Tech. in Artificial Intelligence (AI) and Data Science	Semester: VI
Course: Computational Finance	Course Code: DJS22ADC6013
Course: Computational Finance Laboratory	Course Code: DJS22ADL6013

Teaching Scheme (Hours / week)				Evaluation Scheme						
				Semester End Examination Marks (A)			Continuous Assessment Marks (B)			Total Marks (A+ B)
Lectures	Practical	Tutorial	Total Credits	Theory			Term Test 1	Term Test 2	Total	
				65			20	15	35	100
				Laboratory Examination			Term work		Total Term work	50
3	2	--	4	Oral	Practical	Oral & Practical	Laboratory Work	Tutorial / Mini project / presentation/ Journal		
				25	--	--	15	10	25	

Prerequisite: - Knowledge of Probability and Statistics & Calculus

Course Objectives: The Objective of course is

1. To build the strong foundation in finance.
2. Apply and analyze real time financial data.
3. Enhance problem-solving skills by applying financial concepts to real-world scenarios, ensuring students are prepared to tackle complex financial challenges effectively.

Course Outcomes:

On completion of the course, learner will be able to

1. Understand the knowledge of time value of money, debt and leasing on real time financialdata.
2. Measure the Capital Budgeting and Depreciation.
3. Understand the knowledge of Break-Even Point and Leverage on real time financial data.
4. Apply the knowledge of various investment methods and measuring and managing
   various types of financial risks.
5. Apply the knowledge of Insurance and its types on real time financial data
6. Apply Financial Planning Strategies for Personal and Business Insurance

Computational Finance (DJS22ADC6013)		
Unit	**Description**	**Duration**
1	**Time Value of Money** Simple Interest, Bank Discount, Compound Interest, Annuities. **Debt and Leasing** Credit and Loans, Mortgage Debt, Leasing	**06**
2	**Capital Budgeting and Depreciation** **Capital Budgeting**: Net Present Value, Internal Rate of Return, Profitability Index, Capitalization and Capitalized Cost, Other Capital Budgeting Methods. **Depreciation and Depletion**: The Straight-Line Method, The Fixed- Proportion Method, The Sum-of-Digits Method, The Amortization Method, The Sinking Fund Method, Composite Rate and Composite Life, Depletion	**05**
3	**Break-Even Point and Leverage** **Break-Even Analysis**: Deriving BEQ and BER, BEQ and BER Variables, Cash Break-Even Technique, The Break-even Point and the Target Profit, Algebraic Approach to the Break-Even Point, The Break-Even Point When Borrowing, Dual Break-Even Points, Other Applications of the Break-Even Point, BEQ and BER Sensitivity to their Variables, Uses and Limitations of Break-Even Analysis. **Leverage**: Operating Leverage, Fixed Cost, and Business Risk, Financial Leverage, Total or Combined Leverage	**06**
4	**Investment** **Stocks**: Buying and Selling Stocks, Common Stock Valuation, Cost of New Issues of Common Stock, Stock Value with Two-Stage Dividend Growth, Cost of Stock Through the CAPM, Other Methods for Common Stock Valuation, Valuation of Preferred Stock, Cost of Preferred Stock. **Bonds**: Bond Valuation, Premium and Discount Prices, Premium Amortization, Discount Accumulation, Bond Purchase Price Between Interest Days, Estimating the Yield Rate, Duration. **Mutual Funds**: Fund Evaluation, Loads, Performance Measures, The Effect of Systematic Risk (β), Dollar-Cost Averaging. **Options**: Dynamics of Making Profits with Options, Intrinsic Value of Calls and Puts, Time Value of Calls and Puts, The Delta Ratio, Determinants of Option Value, Option Valuation, Combined Intrinsic Values of Options. **Cost of Capital and Ratio Analysis**: Before-Tax and After-Tax Cost of Capital, Weighted-Average Cost of Capital, Ratio Analysis, The DuPont Model, A Final Word About Ratios.	**11**
5	**Return and Risk** **Measuring Return and Risk**: Expected Rate of Return, Measuring the Risk,Risk Aversion and Risk Premium, Return and Risk at the Portfolio Level, Markowitz's Two-Asset Portfolio, Lending and Borrowing at a Risk-Free Rate of Return, Types of Risk. **The Capital Asset Pricing Model (CAPM)**: The Financial Beta (β), The	**05**

	CAPM Equation, The Security Market Line, SML Swing by Risk Aversion	
6	**Insurance: Life Annuities**: Mortality Table, Commutation Terms, Pure Endowment, Types of Life Annuities. **Life Insurance**: Whole Life Insurance Policy, Annual Premium: Whole Life Basis, Annual Premium: m-Payment Basis, Deferred Whole Life Policy, Deferred Annual Premium: Whole Life Basis, Deferred Annual Premium: m-Payment Basis, Term Life Insurance Policy, Endowment Insurance Policy, Annual Premium for the Endowment Policy, less than Annual Premiums, Natural Premium vs. the Level Premium, Reserve and Terminal Reserve Funds, Benefits of the Terminal Reserve, How Much Life Insurance Should You Buy? **Property and Casualty Insurance**: Deductibles and Co-Insurance, Health Care Insurance,Policy Limit.	**06**
	TOTAL	**39**

Suggested List of Experiments

Computational Finance Laboratory (DJS22ADL6013)	
Sr. No.	**Title of Experiment**
1	Working with financial market data: data import, charting and basic analysis
2	Financial data: statistical analysis and simulation
3	Volatility estimation
4	The Amortization method
5	The Sinking Fund method
6	Break-Even Analysis
7	Option pricing models and analysis
8	Interest rate modelling and sensitivity analysis
9	Portfolio analysis
10	Risk estimation
11	Capital Asset Pricing Model: Minimum 10 experiments from the above- suggested list or any other experiment based on syllabus will be included, which would help the learner to apply the concept learnt.

Minimum eight experiments and mini project from the above suggested list or any other experiment based on syllabus will be included, which would help the learner to apply the concept learnt

Books Recommended:

Textbooks:

1. Paul Wilmott, Paul Wilmott on Quantitative Finance, 3 Volume Set, 2013, 2nd edition, Wiley
2. JoergKienitz and Daniel Wetterau, Financial Modelling: Theory, Implementation and Practice with MATLAB, 2012, 1st edition, Wiley Finance Series.

Reference Books:

1. Dan Stefanica., A Primer for the Mathematics of Financial Engineering, 2011, 2nd Edition FE Press, New York.
2. John C. Hull and Sankarshan Basu, Options, futures & other derivatives, 2018, 10th edition, Pearson India.
3. Tsay, Ruey S. Analysis of Financial Time Series, 2011, 3rd edition, John Wiley & Sons.
4. R. Seydel: Tools for Computational Finance, 2017, 6th edition, Springer.
5. David Ruppert, Statistics and Data Analysis for Financial Engineering, 2011, Springer

Web Links:

1. Corporate Finance Institute (CFI) - Capital Budgeting
   Link: https://corporatefinanceinstitute.com/resources/knowledge/finance/capital-budgeting/
2. Investopedia - Time Value of Money
   https://www.investopedia.com/terms/t/timevalueofmoney.asp
3. The Balance - Health Insurance Explained
   https://www.thebalance.com/health-insurance-4070812

Online Resources:

1. Coursera - Financial Management Courses
   https://www.coursera.org/browse/business/financial-management
2. Khan Academy - Finance and Capital Markets
   https://www.khanacademy.org/finance-economics
3. NPTEL COURSE: Financial Accounting and Analysis (Prof. S. K. Agarwal, IIT Kanpur)https://nptel.ac.in/courses/110/105/110105102/

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper will be based on the entire syllabus summing up to 65 marks.

2. Total duration allotted for writing the paper is 2 hrs.

Continuous Assessment (B):

Theory:

1. Two term tests of 20 marks and 15 marks will be conducted during the semester out of which; one will be a compulsory term test (on minimum 02 Modules) and the other can either be a term test or an assignment on live problems or a course project.

2. Total duration allotted for writing each of the paper is 1 hr.

3. Total of the marks scored in both the two tests will be considered for final grading.

Laboratory: (Term work)

The distribution of marks for term work shall be as follows:

1. Laboratory work (Performance of Experiments): 15 Marks
2. Mini Project /Journal documentation (Write-up and/or Assignments): 10 marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

20/12/2024

Prepared by | Checked by | Head of the Department | Vice Principal | Principal

Syllabus for Third Year B. Tech Program in Artificial Intelligence (AI) and Data Science- Semester VI (Autonomous)

Program: B.Tech. in Artificial Intelligence (AI) and Data Science										Semester: VI
Course: Social Media Analytics										Course Code: DJS22ADC6014
Course: Social Media Analytics Laboratory										Course Code: DJS22ADL6014
Teaching Scheme (Hours / week)				Evaluation Scheme						
				Semester End Examination Marks (A)			Continuous Assessment Marks (B)			Total marks (A+ B)
Lectures	Practical	Tutorial	Total Credits	Theory			Term Test 1	Term Test 2	Total	
				65			20	15	35	100
				Laboratory Examination			Term work		Total Term work	50
3	2	–	4	Oral	Practical	Oral & Practical	Laboratory Work	Tutorial / Mini project / presentation/ Journal		
				25	–	–	15	10	25	

Prerequisite: Graph Theory, Data Mining, Data visualization, Python/R programming

Course Objectives: The Objective of course is

1. Understand the fundamentals of social media and its significance in modern communication
2. Develop skills in social media analytics and assess the effectiveness of social media strategies using various tools.
3. Apply visualization techniques for interpreting and presenting social media data insights.
4. Examine the ethical and legal implications of utilizing social media data for analytics.

Outcomes: Students will be able to

1. Understand the fundamental concepts of social media and its impact on communication
2. Describe the significance of social media analytics in evaluating online presence and decision-making
3. Analyze the effectiveness of social media strategies using quantitative and qualitative metrics
4. Utilize various social media analytics tools to extract and interpret relevant data
5. Apply effective visualization techniques to represent and communicate insights from social media data
6. Evaluate the ethical and legal considerations involved in the use of social media data for analytics.

	Social Media Analytics (DJS22ADC6014)	
Unit	**Description**	**Duration**
1	**Social Media Analytics** Characteristics of Social Media, Types of Social Media (e.g., Facebook, Instagram, Reddit, Bluesky), Social media landscape, Need for Social Media Analytics (SMA), SMA in small & large organizations. Purpose of Social Media Analytics, Social Media vs. Traditional Business Analytics, Seven Layers of Social Media Analytics, Types of Social Media Analytics, Social Media Analytics Cycle, Challenges to Social Media Analytics, Social Media Analytics Tools	06
2	**Social Network Structure and its media analytics** Types of social networks (e.g., Bluesky, Facebook), Measurement and Collection of Social Network Data. Techniques to study different aspects of OSNs — Follower-followee dynamics, link farming, spam detection, hashtag popularity and prediction, linguistic styles of tweets. Case Study: An Analysis of Demographic and Behavior Trends using Social Media: Facebook, Instagram, and Bluesky.	07
3	**Social Media Text, Action & Hyperlink Analytics** Social Media Text Analytics - Types of Social Media Text, Purpose, of Text Analytics, steps in Text Analytics, Social Media Text Analysis Tools, embedding techniques for textual representation. Social Media Action Analytics - What Is Actions Analytics? Common Social Media Actions, Actions Analytics Tools, Social Media Hyperlink Analytics - Types of Hyperlinks, Types of Hyperlink Analytics, Hyperlink Analytics Tools Sentiment Analysis and Stance Detection.	07
4	**Social Media Location & Search Engine Analytics** Location Analytics - Sources of Location Data, Categories of Location Analytics, Location Analytics and Privacy Concerns, Location Analytics Tools Search Engine Analytics - Types of Search Engines, Search Engine Analytics, Search Engine Analytics Tools	06
5	**Applied Social Data Analytics** Application of Topic models, Information Diffusion, Opinions and Sentiments – Mining, Analysis and Summarization, Use of LLMs (Large Language Models) for sentiment and stance analysis. Recommendation Systems, Language dynamics and influence in online communities, Community identification, link prediction and topical search in social networks, Case Study: Sentiment and Stance Analysis Using LLMs.	07
6	**Social Media Analytics Applications and Privacy** Social media in public sector - Analyzing public sector social media,analyzing individual users, case study. Business use of Social Media - Measuring success, Interaction andmonitoring, case study. Privacy - Privacy policies, data ownership and maintaining privacyonline. online abuse detection and digital safety measures in social media applications	06
	TOTAL	39

Suggested List of Experiments: -

	Social Media Analytics Laboratory (DJS22ADL6014)
Sr. No.	**Title of the Experiment**
1	To Study Various types of Social Media Analytic tools i.e.,Netlytic, Google analytics, Power BI, Facebook insights.
2	Perform Website traffic analysis and content analytics
3	Implement social media network analytics
4	To implement a Bluesky API to scrape and analysis of comments from videos.
5	Implement social media text analytics including embedding
6	Perform Sentiment and Stance Detection on social media text using LLMs.
7	Perform hyperlink analytics
8	Perform social media monitoring using location analytics on YouTube
9	Search Engine Analytics
10	To Perform Sentiment Analysis and Visualization of ChatGPT4 Tweets.
11	Mini Project

Minimum eight experiments and mini project from the above suggested list or any other experiment based on syllabus will be included, which would help the learner to apply the concept learnt.

Books Recommended:

Textbooks:

1. Seven Layers of Social Media Analytics_ Mining Business Insights from Social Media Text, Actions, Networks, Hyperlinks, Apps, Search Engine, and Location Data, Gohar,2015.
2. Analyzing the Social Web 1st Edition by Jennifer Golbeck,2017.
3. Mining the Social Web_ Analyzing Data from Facebook, Twitter, LinkedIn, and Other Social Media Sites, Matthew A Russell, O'Reilly,2019.
4. Charu Aggarwal (ed.), Social Network Data Analytics, Springer, 2011

Reference Books:

1. Social Media Analytics [2015], Techniques and Insights for Extracting Business Value.
2. Social Media Analytics Strategy_ Using Data to Optimize Business Performance, Alex,2017.
3. Social Media Data Mining and Analytics, Szabo, G., G. Polatkan, O. Boykin & A. Chalkiopoulus (2019), Wiley, ISBN 978-1-118-82485-6.

Web Links:

1. Social Media Data Analytics https://buffer.com/library/social-media-analytics-tools/

Online Resources

1. Social Media Data Analytics https://www.coursera.org/learn/social-media-data-analytics?msockid=0fba0991cc8d64af281a1ae9cd3f657a
2. Introduction to social media analytics https://www.coursera.org/learn/social-media-analytics-introduction

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper will be based on the entire syllabus summing up to 65 marks.
2. Total duration allotted for writing the paper is 2 hrs.

Laboratory:

Oral & Practical examination will be based on the entire syllabus including, the practical performed during laboratory sessions.

Continuous Assessment (B):

Theory:

1. One term test of 20 marks and one term test of 15 marks will be conducted during the semester
2. Total duration allotted for writing each of the paper is 1 hr.
3. Total of the marks scored in both the two tests will be considered for final grading.

Laboratory: (Term work)

The distribution of marks for term work shall be as follows:

i. Laboratory work (Performance of Experiments): 15 marks
ii. Mini Project / Journal Documentation (Write-up and Assignments): 10 marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

Prepared by | Checked by | Head of the Department | Vice Principal | Principal

Program: B. Tech. in Artificial Intelligence (AI) and Data Science				Semester: VI						
Course: Professional and Business Communication Laboratory				Course Code: DJS22IHL						
Teaching Scheme (Hours / week)				Evaluation Scheme						
				Semester End Examination Marks (A)			Continuous Assessment (B) Marks			Total Marks (A+ B)
Lectures	Practical	Tutorial	Total Credits	Theory			Term Test 1	Term Test 2	Avg.	
				--			--	--	--	--
				Laboratory Examination			Term work		Total Term work	50
--	4*	--	2	Oral	Practical	Oral & Practical	Laboratory Work	Tutorial / Mini project/presentation/ Journal		
				--	--	--	--	--	50	

***(2 hours of Theory to be conducted classwise and 2 hours of practical batchwise)**

Prerequisite:

1. Basic course in Effective Communication Skills

Objectives: The Objective of course is

1. To inculcate professional and ethical attitude at the workplace
2. To enhance communication and interpersonal skills
3. To develop effective employability skills
4. To hone written skills for technical documentation

Outcomes: On completion of the course, the learner will be able to:

1. Prepare technical documents using appropriate style, format, and language
2. Use employability skills to optimize career opportunities
3. Employ storytelling techniques in corporate situations
4. Conduct effective meetings and document the process
5. Demonstrate interpersonal skills in professional and personal situations
6. Describe cultural differences, etiquettes, and the concept of professional ethics

Professional and Business Communication Laboratory (DJS22IHL)		
Unit	**Description**	**Duration**
	Unit 1: Technical Writing	
1	**Report Writing:** Types of reports, Basic structure of a report, collection of data through questionnaires, survey analysis, language, and style in reports **Business Proposal Writing:** Types of business proposals, format of proposal, language and style, presentation of proposal **Plagiarism:** Types of plagiarism, consequences of plagiarism	06
	Unit 2: Employment Skills	
2	**Group Discussion:** Purpose of a GD, types of GD, criteria for evaluating GD, Dos and Don'ts of GD **Resume Writing:** Types of resumes, structure, content, and formatting of resume **Interview Skills:** Types and modes of interview, Preparation for interview, Dos and Don'ts of interview, frequently asked questions during interview **Presentation Skills:** Presentation strategies, overcoming stage fear, techniques to prepare effective PowerPoint presentation	08
	Unit 3: Corporate Story Telling	
3	**Basics of storytelling:** Setting, characters, plot, crisis, climax, resolution, Benefits of storytelling **Types of stories:** Elevator pitch, product stories, event stories, stories in presentations, storytelling in SOP's and interviews, storytelling to manage conflict or to motivate **Storytelling techniques:** Narration using verbal and non-verbal communication, Analysis of storytelling strategies of corporate master storytellers	03
	Unit 4: Meetings and Documentation	
4	**Planning and preparation for meetings:** Planning layout of meetings, arranging logistics, defining roles and responsibilities **Strategies for conducting effective meetings:** Follow the agenda, record discussion, observe meeting decorum **Documentation:** Draft notice, agenda, and minutes of meeting **Business meeting etiquettes:** Verbal and non-verbal aspects of etiquettes	02
	Unit 5: Introduction to Interpersonal Skills	
5	**Emotional Intelligence:** Definition, difference between IQ and EQ, how to develop EQ **Leadership:** Types of leadership, leadership styles, case studies **Team Building:** Difference between group and team, importance of teamwork, strategies to be a good team player **Time Management:** Importance of time management, cultural views of time, 80/20 rule, time wasters, setting priorities and goals **Conflict Management:** Types of conflicts, strategies to manage conflict, case studies	05
	Unit 6: Cross-cultural communication and Professional ethics	
6	**Communication across cultures**: Understanding cultures and developing sensitivity towards cultural differences **Corporate etiquettes**: Telephone, dining, cubicle etiquette, etc.	02

	Professional ethics: Effective work habits, accountability, integrity, and excellence	
	TOTAL	**26**

Professional and Business Communication Laboratory (DJS22IHL)	
Exp.	**Suggested exercises (DJS22IHL)**
1	Draft a questionnaire for survey analysis
2	Prepare individual resume
3	Compose responses for frequently asked questions in an interview
4	Create a Power point presentation
5	Use storytelling in a given corporate situation
6	Conduct a mock meeting and prepare the related documents
7	Perform a team building activity
8	Perform an interpersonal skills related activity
9	Discuss a case related to professional ethics
10	Perform a role play on corporate etiquettes

Minimum eight exercises from the above suggested list or any other activity based on syllabus will be included, which would help the learner to apply the concept learnt.

Books Recommended:

1. Fred Luthans, *"Organizational Behavior"*, McGraw Hill,11th edition 2019.

2. Lesiker and Petit, *"Report Writing for Business"*, McGraw Hill, edition 2004

3. Huckin and Olsen, *"Technical Writing and Professional Communication"*, McGraw Hill,1991.

4. Wallace and Masters, *"Personal Development for Life and Work"*, Thomson Learning, 12th edition

5. Heta Murphy, *"Effective Business Communication"*, Mc Graw Hill, 7th edition 2017.

6. Sharma R.C. and Krishna Mohan, *"Business Correspondence and Report Writing"*, Tata McGraw-Hill Education ,2017.

7. Ghosh, B. N., *"Managing Soft Skills for Personality Development"*, Tata McGraw Hill. Lehman,2017.

8. Bell, Smith, "Management Communication" Wiley India Edition, 3rd edition 2011.

9. Dr. Alex, K.," Soft Skills", S Chand and Company ,2010.

10. Subramaniam, R., "Professional Ethics" Oxford University Press,2nd edition,2017.

Online Resources:

1. Business English Communication https://archive.nptel.ac.in/courses/109/106/109106129/
2. Business Communication https://onlinecourses.swayam2.ac.in/imb24_mg54/preview
3. Management International Business Communication
   https://archive.nptel.ac.in/courses/110/105/110105051/

Evaluation Scheme:

Laboratory: (Term work)

The distribution of marks for term work shall be as follows:

Tutorials ..... (25) Marks

Business Proposal..... (15) Marks

Group Discussion..... (10) Marks

TOTAL: ..... (50) Marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

Prepared by Checked by Head of the Department Vice Principal Principal

Program: B.Tech. in Artificial Intelligence (AI) and Data Science										Semester : VI
Course : Innovative Product Development IV										Course Code: DJS22ILLL2
Teaching Scheme (Hours / week)				Evaluation Scheme						
				Semester End Examination Marks (A)			Continuous Assessment Marks (B)			Total marks (A+ B)
Lectures	Practical	Tutorial	Total Credits	Theory			Term Test 1	Term Test 2	Avg.	
				--			--	--	--	--
				Laboratory Examination			Term work			
--	2	--	1	Oral	Practical	Oral & Practical	Laboratory Work	Tutorial / Mini project / presentation/ Journal	Total Term work	50
				--	--	25	15	10	25	

Course Objectives: The Objective of course is

1. To acquaint the students with the process of identifying the need (considering a societal requirement) and ensuring that a solution is found out to address the same by designing and developing an innovative product.
2. To familiarize the students with the process of designing and developing a product, while they work as part of a team.
3. To acquaint the students with the process of applying basic engineering fundamentals, so as to attempt at the design and development of a successful value added product.
4. To inculcate the basic concepts of entrepreneurship and the process of self-learning and research required to conceptualize and create a successful product.

Outcome: Learner will be able to:

1. Identify the requirement for a product based on societal/research needs.
2. Apply knowledge and skills required to solve a societal need by conceptualising a product, especially while working in a team.
3. Use standard norms of engineering concepts/practices in the design and development of an innovative product.
4. Draw proper inferences through theoretical/ experimental/simulations and analyse the impact of the proposed method of design and development of the product.
5. Develop interpersonal skills, while working as a member of the team or as the leader.
6. Demonstrate capabilities of self-learning as part of the team, leading to life-long learning, which could eventually prepare themselves to be successful entrepreneurs.
7. Demonstrate product/project management principles during the design and development work and

also excel in written (Technical paper preparation) as well as oral communication.

Guidelines for the proposed product design and development:

- Students shall form a team of 3 to 4 students (max allowed: 5-6 in extraordinary cases, subject to the approval of the department review committee and the Head of the department).
- The working model is to be validated with proper justification and the report is to be compiled in a standard format and submitted to the department. Efforts are to be made by the students to try and publish the extended technical paper, either in the institute journal, "Techno Focus: Journal for Budding Engineers" or at a suitable publication, approved by the department research committee/ Head of the department.
- Faculty supervisor may provide inputs to students during the entire span of the activity, spread over 2 semesters, wherein the main focus shall be on self-learning.
- A record in the form of an activity log-book is to be prepared by each team, wherein the team can record weekly progress of work. The guide/supervisor should verify the recorded notes/comments and approve the same on a weekly basis.
- The focus should be on self-learning, capability to design and innovate new products as well as on developing the ability to address societal problems. Advancement of entrepreneurial capabilities and quality development of the students through the year long course should ensure that the design and development of a product of appropriate level and quality is carried out, spread over two semesters, i.e. during the semesters V and VI.

Guidelines for Assessment of the work:

- The review/ progress monitoring committee shall be constituted by the Head of the Department. The progress of design and development of the product is to be evaluated on a continuous basis, holding a minimum of two reviews in each semester.
- In the continuous assessment, focus shall also be on each individual student's contribution to the team activity, their understanding and involvement as well as responses to the questions being raised at all points in time.
- Oral examination should be conducted by Internal and External examiners. Students have to give presentation and demonstration on their working mode

Distribution of term work marks during the subsequent semester shall be as given below:

- Marks awarded by the supervisor based on log-book :10
- Marks awarded by review committee: 10
- Quality of the write-up: 05

The overall work done by the team shall be assessed based on the following criteria;

- Quality of survey/ need identification of the product.

- Clarity of Problem definition (design and development) based on need.
- Innovativeness in the proposed design.
- Feasibility of the proposed design and selection of the best solution.
- Cost effectiveness of the product.
- Societal impact of the product.
- Functioning of the working model as per stated requirements.
- Effective use of standard engineering norms.
- Contribution of each individual as a member or the team leader.
- Clarity on the write-up and the technical paper prepared.

The semester reviews (V and VI) may be based on relevant points listed above, as applicable.

Guidelines for Assessment of Semester Reviews:

The write-up should be prepared as per the guidelines given by the department.

The design and the development of the product shall be assessed through a presentation and demonstration of the working model by the student team to a panel of Internal and External Examiners, preferably from industry or any research organisations having an experience of more than five years, approved by the Head of the Institution. The presence of the external examiner is desirable only for the 2nd presentation in semester VI. Students are compulsorily required to present the outline of the technical paper prepared by them during the final review in semester VI.

Prepared by | Checked by | Head of the Department | Vice Principal | Principal