Shri Vile Parle Kelavani
Mandal's

Dwarkadas J. Sanghvi College of Engineering

(Autonomous College Affiliated to the University of Mumbai)

Scheme and detailed syllabus

Final Year B.Tech

in

Artificial Intelligence and Machine Learning

(Semester VII)

Academic Year 2024-25

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 Final Year Undergraduate Program in Artificial Intelligence and Machine Learning: Semester VII (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	DJ19AMC701	High Performance Computing	3	–	–	3	25	–	25	75	–	–	–	75	100	4
	DJ19AML701	High Performance Computing Laboratory	–	2	-	1	–	25	25	–	25	–	–	25	50	
2	DJ19AMC702	Large Language Models	3	–	–	3	25	–	25	75	–	–	–	75	100	4
	DJ19AML702	Large Language Models Laboratory	–	2	–	1	–	25	25	–	25	–	–	25	50	
3	DJ19AML703	Big Data Laboratory	–	4	–	2	–	25	25	–	–	–	25	25	50	2
4@	DJ19AMEC7011	Elective1: Robotics	3	–	–	3	25	–	25	75	–	–	–	75	100	4
	DJ19AMEL7011	Elective1: Robotics Laboratory	–	2	–	1	–	25	25	–	25	–	–	25	50	
	DJ19AMEC7012	Elective 2: Artificial Intelligence in Finance	3	-	–	3	25	–	25	75	–	–	–	75	100	
	DJ19AMEL7012	Elective 2 : Artificial Intelligence in Finance Laboratory	–	2	-	1	–	25	25	–	25		–	25	50	
	DJ19AMEC7013	Elective 3: Artificial Intelligence in Cyber Security	3	–	–	3	25	–	25	75	–	–	–	75	100	
	DJ19AMEL7013	Elective 3: Artificial Intelligence in Cyber Security Laboratory	–	2	–	1	–	25	25	–	25	–	–	25	50	
5#	DJ19ILO7011	Product Life Cycle Management	3	–	–	3	25	–	25	75	–	–	–	75	100	3
	DJ19ILO7012	Management Information System	3	–	–	3	25	–	25	75	–	–	–	75	100	
	DJ19ILO7013	Operations Research	3	–	–	3	25	–	25	75	–	–	–	75	100	
	DJ19ILO7014	Cyber Security and Laws	3	–	–	3	25	–	25	75	–	–	–	75	100	
	DJ19ILO7015	Personal Finance Management	3	–	–	3	25	–	25	75	–	–	–	75	100	
	DJ19ILO7016	Energy Audit and Management	3	–	–	3	25	–	25	75	–	–	–	75	100	
	DJ19ILO7017	Disaster Management and Mitigation Measures	3	–	–	3	25	–	25	75	–	–	–	75	100	
	DJ19ILO7018	Science of Well-being	3	–	–	3	25	–	25	75	–	–	–	75	100	
	DJ19ILO7019	Research Methodology	3	–	–	3	25	–	25	75	–	–	–	75	100	
	DJ19ILO7020	Public Systems and Policies	3	–	–	3	25	–	25	75	–	–	–	75	100	
6	DJ19CEP703	Project Stage - I	–	4	–	2	–	50	50	–	50	–	–	50	100	2
		Total	12	14	0	18	375	200	575	1125	175	0	25			19

Th	Theory	TW	Termwork
P	Practical	O	Oral
T	Tutorial		

@ Any 1 Elective Course

Any 1 Institute Level Elective

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Checked by

Head of the Department

Vice Principal

Principal

Continuous Assessment (A):

Course	Assessment Tools	Marks	Time (hrs.)
Theory	One Term test (based on 40 % syllabus)	25 each (Avg.25)	1
	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.	75	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

Prepared by Checked by Department Coordinator Principal

Program: Artificial Intelligence & Machine Learning	B.Tech.	Semester :VII
Course: High Performance Computing (DJ19AMC701)		
Course: High Performance Computing Laboratory (DJ19AML701)		

Prerequisite: System Fundamentals.

Course Objectives:

1. To learn concepts of parallel processing as it pertains to high-performance computing.
2. To design, develop and analyze parallel programs on high performance computing resources using parallel programming paradigm

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

1. Understand different parallel processing approaches and platforms involved in achieving High Performance Computing.
2. Explore GPU and CUDA Programming.
3. Understand the principles of Grid and Cloud Computing with practical examples and applications.
4. Analyze the performance measures in high performance computing.
5. Discover the advanced topic in GPU including libraries and framework.

Detailed Syllabus: High Performance Computing (DJ19AMC701)		
Unit	Description	Duration
1	**Introduction to Parallel Processing:** Parallel processing, Levels of Parallelism, Models (SIMD, MIMD, SIMT, SPMD, Data Flow Models, Demand-driven Computation), Loosely coupled and Tightly coupled. Parallel Architecture (Interconnection network, processor Array, Multiprocessor), Challenges in Parallel Computing, Performance Metrics, Distributed vs. Parallel architectures.	04
2	**Introduction to High Performance Computing:** Principles of HPC, HPC Architectures, HPC vs Parallel Processing, Data partitioning Techniques: Block, cyclic, and block-cyclic partitioning, Domain Decomposition: Spatial, temporal, and functional decomposition, Load balancing, Case Study: Partitioning strategies for matrix multiplication. Communication Models: Shared memory vs. message passing. Point-to-Point Communication: Send/Receive operations in MPI. Collective Communication: Broadcast, scatter, gather, and reduction operations in MPI (MPI_Reduce)	06
3	**GPU and CUDA Programming:** Overview of GPU, evolution of GPU, CPU vs. GPU, overview of CUDA: Features, Benefits, Architecture. Programming Model CUDA: Kernels and kernel launches, Thread and block indexing, CUDA Memory Management: Memory Hierarchy and Memory Management, Case Studies: computational biology, data analytics, and machine learning.	08

4	**Grid and Cloud Computing**: Data & Computational Grids, Grid Architectures and its relation to various Distributed Technologies, Examples of The Grid Computing, Cloud Computing, High Performance Cloud Computing (HPC2), Cloud Tensor Processing Units (TPUs).	07
5	**Performance Optimization:** Speedup, Efficiency and Scalability, Amdahl's Law, Gustafson's Law, Weak vs. Strong Scaling, Performance Bottlenecks, Data Races and Determinism, Data Race Avoidance, Profiling and performance analysis tools for GPUs, Techniques for optimizing GPU performance (warp divergence, loop unrolling, vectorization), Memory bandwidth optimization techniques, Advanced GPU programming concepts (shared memory atomics, warp shuffling). Case Studies: Scientific Computing with CUDA/Real-life application	08
6	**Advanced Topics in GPU:** Introduction to GPU accelerated libraries (cuBLAS, cuDNN, cuGraph), GPU computing frameworks (TensorFlow, PyTorch) and their integration with GPUs, Introduction to GPU clusters and distributed GPU computing, Cluster Setup & its Advantages. Case studies : Real-world applications of GPU computing.	06
		39

Books Recommended:

Textbooks:

1. "High Performance Computing in Clouds: Moving HPC Applications to a Scalable and Cost-Effective Environment", Edson Borin, Lúcia Maria A. Drummond , Jean-Luc Gaudiot, Alba Melo, Maicon Melo Alves , Philippe Olivier Alexandre Navaux, Springer, ISBN-13 978-3031297687, 2023.
2. "High Performance Computing for Drug Discovery and Biomedicine", Alexander Heifetz, Springer Nature, ISBN, 1071634496, 9781071634493, 2023.
3. "Programming in Parallel with CUDA", Richard Ansorge, Cambridge University Press, ISBN-13 978-1108479530, 2022.
4. "Parallel and High Performance Computing", Robert Robey, Yuliana Zamora, Manning publisher, ISBN-13 978-1617296468, 2021
5. "The Practice of Parallel Programming", Sergey A. Babkin, CreateSpace Publisher ISBN-13: 978-1451536614, Online Edition 2021.
6. "Introduction to High Performance computing for Scientist and Engineers", Georg Hager, Gerhard Wellein,, CRC press, 2019.
7. "Hands-On GPU Programming with Python and CUDA" , Dr Brian Tuomanen, Packt Publishing, ISBN-13 978-1788993913, 2018.

Reference Books:

1. "Programming Massively Parallel Processors: A Handson Approach:, David B. Kirk and Wen-mei W. Hwu, , Morgan Kaufmann, 4th Edition, 2022.
2. "CUDA by Example: An Introduction to General-Purpose GPU Programming", Jason Sanders and Edward Kandrot, Addison-Wesley, 1st Edition, 2010.
3. "Introduction to High Performance Computing for Scientists and Engineers", Hager, G. and Wellein, G, CRC Press, ISBN-13 9781439811931, 2010.
4. "High Performance Computing For Dummies", Sun and AMD Special Edition, Douglas Eadline Wiley Publishing, Inc. (2009)

Web Links:

1. Parallel Processing https://hpc.llnl.gov/documentation/tutorials/introduction-parallel-computing-tutorial
2. Introduction to high performance computing https://www.cecam.org/workshop-details/an-introduction-to-high-performance-computing-1270
3. GPU and CUDA Programming https://www.cs.cmu.edu/afs/cs/academic/class/15418-s18/www/lectures/06_gpuarch.pdf
4. Grid and Cloud Computing https://aits-tpt.edu.in/wp-content/uploads/2022/06/GCC-min.pdf
5. Performance Optimization https://link.springer.com/chapter/10.1007/978-3-642-03644-6_12
6. Case Study: https://developer.nvidia.com/blog/a-cuda-dynamic-parallelism-case-study-panda/
7. Case Study https://www.researchgate.net/publication/265817932_CUDA-based_scientific_computing_Tools_and_selected_applications

List of Experiments:

High Performance Computing Laboratory (DJ19AML701)	
Sr. No.	**Suggested Experiments**
1	Set up the CUDA environment, install the CUDA Toolkit, and write a basic CUDA program to understand the CUDA development environment.
2	Implement vector addition using CUDA to introduce students to parallelism, thread management, and memory allocation in GPU programming.
3	Develop a CUDA program for matrix multiplication to understand parallelism and optimization techniques in GPU computing.
4	Apply CUDA for image processing tasks, like blurring and edge detection, to learn how to process images efficiently using GPU parallelism.
5	Implement parallel reduction operations (e.g., sum, min, max) to grasp the concept of efficient parallel reduction.
6	Explore parallel sorting algorithms using CUDA, comparing their performance with CPU based sorting and optimizing CUDA sorting.
7	Employ CUDA to perform a Monte Carlo simulation for estimating mathematical constants or solving real-world problems to understand the power of GPU parallelism.

8	Experiment with CUDA to implement concurrent data structures using locks and atomic operations to learn how to manage data concurrently.
9	Optimize the reduction step in machine learning algorithms using CUDA, focusing on techniques for efficient large-scale data processing.
10	Integrate CUDA-accelerated code with data science frameworks like TensorFlow or PyTorch to develop and run GPU-accelerated machine learning models for practical applications.
11	Perform the Log Analysis-Based Resource and Execution Time Improvement

Batch wise laboratory work of 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.

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Program: Artificial Intelligence & Machine Learning	B. Tech.	Semester: VII
Course: Large Language Models (DJ19AMC702)		
Course: Large Language Models Laboratory (DJ19AML702)		

Pre-requisite: Natural Language Processing, Deep Learning.

Course Objectives:

1. Introduce the fundamental concepts and applications of Generative AI.
2. Provide in-depth understanding of Transformer architecture, the core building block of most Large Language Models (LLMs).
3. Explore various LLM architectures and techniques like BERT, prompt engineering, and fine-tuning.
4. Equip students with the ability to evaluate LLM performance and identify potential biases.
5. Introduce students to Multimodal LLMs that can process and understand different data modalities.

Course Outcomes: Students will be able to

1. Introduce the fundamental concepts and applications of Generative AI and to provide in-depth understanding of Transformer architecture, the core building block of Large Language Models (LLMs).
2. Explore various LLM architectures and techniques like BERT, GPT-3, T5.
3. Apply prompt engineering techniques for effective LLM interaction and understand the concept of Retrieval Augmented Generation (RAG) and its role in LLMs.
4. Evaluate LLM performance and identify potential biases and understand multimodal LLMs that can process and understand different data modalities.

Large Language Models (DJ19AMC702)		
Unit	**Description**	**Duration**
1	**Module 1: Introduction to Generative AI &Transformer Architecture - The Engine of LLMs** Domains of Generative AI, Text Generation, Image Generation, Music Generation, Video Generation. Limitations of RNN & LSTM, Understanding the core building block of most LLMs - the Transformer model, Tokenization, Decoding the Transformer's components: encoders, decoders, attention mechanisms - types, Self-attention vs Flash Attention, feed-forward layer, Reinforcement Learning with AI Feedback (RLAIF), Reinforcement Learning from Human Feedback (RLHF)	8
2	**Module 2: Language Models - Unveiling the Power of Words** Diving into different LLM architectures: BERT (Bidirectional Encoder Representations from Transformers) and its applications, exploring other	8

	notable LLM architectures (e.g.GPT-3, T5), Mixture of Experts (MoE), various benchmarks to evaluate LLMs	
3	**Module 3: Prompt Engineering** Introduction to prompt, examples of prompt, prompt engineering, prompt techniques, zero shot, one shot, few-shot learning, a chain of thought prompting, ReAct Prompting, self-consistency, Tree of thought, LLM based Agents, Large Action Models(LAMs).	7
4	**Module 4: Retrieval Augmentation & Generation (RAG) and Fine-tuning for LLMs** Understanding Retrieval and vector, vector storage: vector indexing, vector libraries, vector databases, Loading and retrieving in Lang Chain, Document loaders, Retrievers in Lang Chain. Fine-tuning: Quantization, PEFT, Full-Fine-tuning vs LoRA vs QLoRA, Fine-Tuning LLMs for different downstream tasks.	6
5	**Module 5: Evaluating LLMs - Measuring Performance and Biases** Learning about common metrics for evaluating LLM performance (e.g., perplexity, BLEU score). Understanding the challenges of bias and fairness in LLMs. Exploring techniques for mitigating bias in LLM development and evaluation, considering prompt design and data selection for RAG models: RAGAS	6
6	**Module 6: Multimodal Architectures - Beyond Text** Introduction to Multimodal LLMs: processing and understanding different data types (text, images, audio). Exploring architectures for Multimodal LLMs: separate encoders, joint embedding spaces. Applications of Multimodal LLMs (e.g., image captioning, video summarization), Multi-task LLMs, Empowering Time Series Analysis with Large Language Models	4
	TOTAL	39

Books Recommended:

Text Books:

1. Ben Auffarth, "Generative AI with LangChain: Build large language model (LLM) apps with Python, ChatGPT, and other LLMs" by Packt Publishing, 2023.
2. Valentina Alto, "Modern Generative AI with ChatGPT and OpenAI Models", by Packt Publishing, 2023.
3. Jay Alammar, Maarten Grootendorst, "Hands-On Large Language Models", by O'Reilly, 2023
4. Thushan Ganegedara, "Natural Language Processing with TensorFlow", by Packt Publishing, Second Edition, 2022.

Reference Books:

1. David Foster, "Generative Deep Learning", O'Reilly, 2020.
2. Lewis Tunstall, Leandro von Werra & Thomas Wolf," Natural Language Processing with Transformers", 2022.
3. Sebastian Raschka, "Build a Large Language Model (From Scratch)", ISBN 9781633437166

Web Resources Blogs and Websites:

1. Mixture of Experts: Mixture of Experts Explained (huggingface.co)
2. PEFT:Efficient Model Fine-Tuning for LLMs: Understanding PEFT by Implementation | by Shivansh Kaushik | Medium
3. Various benchmarks to evaluate LLMs: LLM Benchmarks: Understanding Language Model Performance (humanloop.com)
4. Types of attention mechanism: Understanding and Coding the Self-Attention Mechanism of Large Language Models From Scratch (sebastianraschka.com)
5. Agents| RAG: Intro to LLM Agents with Langchain: When RAG is Not Enough | by Alex Honchar | Mar, 2024 | Towards Data Science
6. React| Agent: Teaching LLMs to Think and Act: ReAct Prompt Engineering | by Bryan McKenney | Medium
7. LLM based Agents : Superpower LLMs with Conversational Agents | Pinecone
8. RAGAS: Evaluating RAG pipelines with Ragas + LangSmith (langchain.dev)
9. Model distillation: LLM distillation demystified: a complete guide | Snorkel AI
10. Sentence classifier |BERT: Classify text with BERT | Text | TensorFlow

Suggested List of Experiments:

Large Language Models Laboratory(DJ19AML702)	
Sr. No.	**Title of the Experiment**
1	Build your own simple LLM Application using Lang Chain.
2	Query PDF using Lang Chain and Pine cone
3	Fine Tuning Pre-trained Model On Custom Dataset Using Transformer
4	Fine Tune LLAMA 2 With Custom Dataset Using LoRA And QLoRA Techniques
5	Text classification using BERT and Tensorflow
6	Question Answering Application using LLM based agents
7	Using in-built tools and creating custom tools for ReAct agent in Langchain.
8	Monitoring RAG applications using Langsmith and evaluating using ragas
9	Build a simple multimodal generative model that combines text and image inputs to generate captions
10	Understanding multimodal models like Gemini vision.
11	Understanding various retrievers in Langchain.
12	Open-sourced LLMs for function calling.
13	Mini project

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.

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Program: Artificial Intelligence & Machine Learning	B.Tech.	Semester: VII
Course: Big Data Laboratory (DJ19AML703)		

Prerequisite: Foundations of Data Analysis, Database Management System, Basic Programming skills.

Course Objectives:

1. Master the setup and configuration of Hadoop clusters using Cloudera, establishing a Hadoop Distributed File System (HDFS).
2. Develop practical skills in MapReduce programming, including Word Count and other examples.
3. Gain proficiency in PostgreSQL installation, database creation, and CRUD operations.
4. Gain proficiency in Pig and Hive built-in functions, master the data transformation with RRD.

Course Outcomes: Students will be able to:

1. Set up and configure Hadoop clusters, and Implement MapReduce programs for data processing and analysis.
2. Utilize PostgreSQL/MongoDB for database management, including creating and managing schemas, tables, and performing complex queries with conditions and joins.
3. Implement Hive built-in functions and operators, execute data processing scripts using Pig Latin.
4. Work with Spark to create and manage RDDs, perform actions and transformations, and implement Machine Learning Algorithms.

Big Data Laboratory (DJ19AML703)		
Unit	**Description**	**Duration**
1	Set up and Configuration Hadoop Using Cloudera Creating a HDFS System with minimum 1 Name Node and 1 Data Nodes HDFS Commands, Set up Hadoop in Linux Environment	8
2	Map Reduce Programming Examples Word Count. Union, Intersection and Difference. Matrix Multiplication. Natural Join Programming Example	8
3	PostgreSQL Database: Data Types, PostgreSQL Schema, Queries, PostgreSQL Table Queries , Clause, PostgreSQL Conditions, Joins and View. Mongo DB: Installation and Creation of database and Collection CRUD Document: Insert, Query, Update and Delete Document	10

4	Hive: Introduction Creation of Database and Table, Hive Partition, Hive Built in Function and Operators, Hive View and Index. Configure Hive Metastore to MySQL	**8**
5	Pig: Pig Latin Basic Pig Shell, Pig Data Types, Creating a Pig Data Model, Reading and Storing Data, Pig Operations.	**8**
6	Spark: RDD, Actions and Transformation on RDD , Ways to Create - file, data in memory, other RDD. Lazy Execution, Persisti RDD Machine Learning Algorithms like K-Means using Spark. Visualization: Connect to data, Build Charts and Analyze Data, Create Dashboard, Create Stories using Tableau.	**10**
	Total	**52**

Books Recommended:

Text books:

1. Practical Statistics for Data Scientists, 2edition by Peter Bruce, Andrew Bruce, Peter Gedeck, O'Reilly Publisher, 2020.
2. Experimental Design and Analysis by Howard J. Seltman, July 11, 2018
3. Tom Mittchell —Machine Learning McGraw Hill,2017.

Reference Books:

1. Data Mining for Business Analytics, (An Indian Adaptation): Concepts, Techniques and Applications in Python, Cambridge University Press, ISBN NO. 978-1108727747, 2019.
2. Andreas C. Müller and Sarah Guido- Introduction to Machine Learning with Python: A Guide for Data Scientists, O'reilly,2016
3. Stephen Marsland, —Machine Learning an Algorithmic Perspective CRC Press, 2015
4. Han Kamber, —Data Mining Concepts & Techniques, Morgan Kaufmann Publishers, 2012.
5. Kevin P. Murphy, Machine Learning — A Probabilistic Perspective, 2012.

Web Links:

1. https://hadoop.apache.org/docs/stable/hadoop-project-dist/hadoop-common/SingleCluster.html
2. https://www.datacamp.com/tutorial/tableau-tutorial-for-beginners
3. https://hadoop.apache.org/docs/stable/hadoop-mapreduce-client/hadoop-mapreduce-client-core/MapReduceTutorial.html
4. https://hadoop.apache.org/docs/r1.2.1/mapred_tutorial.html#Example:+Matrix+Multiplication
5. https://www.postgresqltutorial.com/
6. https://www.postgresql.org/docs/current/queries.html
7. https://cwiki.apache.org/confluence/display/Hive/LanguageManual

8. https://cwiki.apache.org/confluence/display/Hive/LanguageManual+DDL#LanguageManualDDL-PartitionedTables
9. https://cwiki.apache.org/confluence/display/Hive/LanguageManual+UDF
10. https://pig.apache.org/docs/r0.17.0/start.html
11. https://pig.apache.org/docs/r0.17.0/basic.html
12. https://spark.apache.org/docs/3.5.1/

Online Courses:

1. https://onlinecourses.nptel.ac.in/noc20_cs92/preview

Big Data Laboratory (DJ19AML703)	
Sr. No	**List of Suggested Experiments**
1	Install, configure and run Hadoop and HDFS.
2	Implement word count / frequency programs using MapReduce.
3	Implementing simple algorithms in MapReduce Matrix multiplication, Aggregates, joins, sorting.
4	Implement Page Rank Algorithm using Map-Reduce.
5	Install and setup PostgreSQL and run basic table commands.
6	Implement advance commands in PostgreSQL.
7	Create Hive Databases and Tables, Hive Partitioning and Indexing.
8	Use built-in Hive functions and operators to manipulate and query data. Perform aggregations, filtering, and data transformations using HiveQL.
9	Implement and Perform Streaming Data Analysis using flume for data capture, HIVE for data analysis of twitter data, chat data, weblog analysis.
10	Write Pig scripts to solve specific data processing tasks or analyze sample datasets.
11	Create RDDs from various data sources such as files and in-memory collections. Perform transformations and actions on RDDs and analyze the results.
12	Implement k-means clustering technique using SPARK.
13	Data Visualization with Tableau.

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.

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Program: Artificial Intelligence & Machine Learning	B.Tech.	Semester: VII
Course: Robotics (DJ19AMEC7011)		
Course: Robotics Laboratory (DJ19AMEL7011)		

Course Objectives:

1. Develop a comprehensive understanding of robot anatomy
2. Gain proficiency in direct and inverse kinematics, coordinate frames, and rotations.
3. Learn the principles of workspace analysis, trajectory planning, and various motion operations to design and implement efficient robotic movements.
4. Integrate and Program Robotic Systems

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

1. Explain the basics of robot anatomy, movement mechanisms, and classifications, and apply this knowledge to real-world robotic systems.
2. Perform kinematic analysis and solve direct and inverse kinematics problems for various robot configurations, enhancing their problem-solving skills in robotics.
3. Conduct workspace analysis and trajectory planning, and will implement pick-and-place.
4. Capable of using ROS for robot programming, interface sensors and actuators.

Detailed Syllabus: Robotics (DJ19AMEC7011)		
Unit	**Description**	**Duration**
1	**Robot Fundamentals:** Basic of Robot Anatomy, Robot Movement, Mechanisms and transmission, Classification. **Direct and Inverse Kinematics:** Co-ordinate frames, Rotations, Link Coordination Arm Equation, (Two axis , Three axis, Four-axis robot SCARA, Five-axis only Rhino XR-3 Robot).General properties of solutions Tool configuration Two axis, Three axis planar articulated, Four axis SCARA, Five axis robots only Rhino XR-3 Robot	08
2	**Workspace Analysis and Trajectory Planning:** Introduction to Workspace Analysis and Trajectory Planning, Work Envelop and examples, Pick and place operations, Continuous path motion, Interpolated motion, Straight-line motion.	06
3	**Robot Sensor, Actuator, Interface & Programming:** Principle of sensors, Sensor types: LiDAR (Light Detection and Ranging, Ultrasonic sensors, Camera. Sensor Input/output (I/O): Analog-to-Digital Converters (ADCs), Sensor Calibration, Interfacing and I2C, Actuator: Direct Control and Speed Control: PWM, Electric Motors, Pneumatic Actuator, Servo Motors. Basic Embedded File system, hex files, Simulators and Emulators, Integrated development environments, commonly used IDE. Python for Robot Programming, Program structure, data types, control structure.	08

4	**Robotics Convergence Technology:** Telemetric camera Robotic System, Non- Imaging Sensors, Machine Learning for Robotics: Supervised learning for robot control, Reinforcement learning for robot decision making. Computer Vision for Robotics: Object recognition, Image segmentation, Visual SLAM (Simultaneous Localization and Mapping), Sensor Fusion and Perception: Combining data from multiple sensors for robot understanding. Knowledge representation, planning, and task scheduling. Sound and touch sensing, People sensing, Autonomous mobile robot, humanoid robots and simulated humans, human-robot interaction.	08
5	**Robot Operating System** ROS Basics, Supporting ROS, ROS Architecture and Concepts, ROS File system, ROS Computation Graph Level, ROS Community Level, ROS Workspace and Package, ROS Client Library, ROS Programming Concept: Motion planning, Behavior control, Machine learning integration.	04
6	**Building the Robots:** Introduction to Wheeled Robot, Hardware, Block Diagram and Assembling Robot Hardware, Programming Robot Firmware, path planning. Robot Applications in AI (case studies): Exploration of self-driving cars, industrial robots, assistive robots, and other AI-powered robotic applications. Focus on the interplay between hardware and software aspects. Case study: Tetrix , NAO, Ned Niryo , Auto Auto.	05
	Total	**39**

Books Recommended:

Textbooks:

1. "Basic concepts of AI and Robotics", Dr. M. Purushotham, T V Sathyanarayana, Dr. Shafqat Nabi Mughal, Dr. Pallavi Sapkale, AG Publishing House, ISBN: 9788119025343, Edition: First Edition, 2023.
2. "Fundamentals of Robot Kinematics and Dynamics", Ishwar Singh, Birinder Pal Kaur, ISBN-13 979-8870762753, 2023.
3. "Robot Operating System (ROS) for Absolute Beginners: Robotics Programming Made Easy," Lentin Joseph, 1st Edition, A Press, 2018.
4. "Mechatronics", W. Bolton, Pearson, 2018.
5. "Mastering ROS for Robotics Programming: Design, build, and simulate complex robots using the Robot Operating System", Jonathan Cacace; Lentin Joseph, 2nd Edition, Packet Publishing, 2018.
6. "Handbook of Modern Sensors", Jacob Fraden, Springer 2016.

References:

1. "Human-Centered AI: A Multidisciplinary Perspective for Policy-Makers, Auditors, and Users,", Catherine Régis (Editor), Jean-Louis Denis (Editor), Maria Luciana Axente (Editor), Atsuo Kishimoto (Editor), ISBN 13- 978-1032341620, 2024.

2. "Introduction To AI Robotics", Second Edition, Bradford Books, ISBN 13- 978-0262038485, 2019.
3. "Industrial Robotics", Mikell P. Groover, McGraw Hill, 2nd edition, 2012.
4. "Introduction to Robotics", John J. Craig, 3rd Edition, Addison Wesley, ISE 2008.

Online Resources:

1. Robot Anatomy, Movement, Mechanisms, and Transmission https://motion.cs.illinois.edu/RoboticSystems/AnatomyOfARobot.html
2. robot configurations and joint types https://instrumentationtools.com/robot-anatomy-configuration-reference-frame-characteristics/
3. Workspace Analysis and Trajectory Planning https://motion.cs.illinois.edu/RoboticSystems/AnatomyOfARobot.html
4. Robot Interface & Programming https://www.wevolver.com/article/robot-joint
5. Basic Embedded Systems and Python for Robot Programming https://motion.cs.illinois.edu/RoboticSystems/AnatomyOfARobot.html
6. Robotics Convergence Technology https://www.wevolver.com/article/robot-joint
7. Robot Operating System (ROS) https://instrumentationtools.com/robot-anatomy-configuration-reference-frame-characteristics/
8. Building Robots and Path Planning https://instrumentationtools.com/robot-anatomy-configuration-reference-frame-characteristics/
9. Robot Applications in AI (Case Studies) https://www.wevolver.com/article/robot-joint

Robotics Laboratory (DJ19AMEL7011)	
Sr. No.	**Suggested Experiments**
1	**Exploring Robot Anatomy** Objective: Identify and understand the various parts of a robot (e.g., sensors, actuators, controllers). Objective: Study different types of mechanisms (e.g., gears, belts) and transmission systems in robots.
2	Simulation of Forward and Inverse Kinematics.
3	**Workspace Analysis of a SCARA Robot** Objective: Analyse the workspace of a four-axis SCARA robot and identify its limitations using simulation software.
4	Create a Robot structure for pick and place operation
5	**Basic ROS Node Creation** Objective: Create and run basic publisher and subscriber nodes in ROS. (Write simple nodes in Python/C++ and communicate between them.)
6	Implement a line following robot using ROS and appropriate sensors.
7	Interfacing Arduino/ Raspberry Pi with ROS.
8	Programs of Tetrix and NAO.
9	Programs on Ned Niryo and Auto Auto.

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.

Prepared by Checked by Department Coordinator Principal

Program: Artificial Intelligence & Machine Learning	B.Tech	Semester: VII
Course: Artificial Intelligence in Finance (DJ19AMEC7012)		
Course: Artificial Intelligence in Finance Laboratory (DJ19AMEL7012)		

Course Objective: The course objective is to understand the role of AI in finance, learn risk and portfolio management, develop and evaluate the credit scoring models, and investigate the application of AI in detection and prevention of fraud.

Course Outcome: On successful completion of this course, learner will be able to:

1. Demonstrate Knowledge of AI Applications and its role in Finance.
2. Implement Risk Management Models to assess and manage financial risks.
3. Optimize financial portfolio strategies that align with given risk profiles and investment goals.
4. Develop AI-driven credit scoring models and compare their performance to traditional scoring systems.
5. Design the fraud detection system that detect and prevent potential fraudulent activities.

Artificial Intelligence in Finance (DJ19AMEC7012)		
Detailed Syllabus: Artificial Intelligence in Finance (DJ19AMEC7012)		
Unit	**Description**	**Duration**
1	**Introduction:** Taxonomy for finance- asset, liabilities, income, expenses, revenue, profit, cost of goods sold (COGS), gross margin, net income, balance sheet, income statement, ROI, liquidity, interest, inflation, financial markets (stock, Bond, commodity, forex), Equities, derivatives, Corporate and personal finance, Financial Statements and ratios, financial planning.	8
2	**Role of AI in Finance:** AI and its significance in finance, evolution of AI in finance, AI techniques used in finance, Forecasting and its importance in finance, challenges in financial forecasting, Forecasting Methods: TSA, ML, DL, Semantics Analysis, Applications of AI in Finance: fraud detection, credit scoring, algorithmic trading, risk management. Efficient Markets: Market Prediction Based on Returns Data, Market Prediction with More Features, Market Prediction Intraday, Dense Neural Networks: The Data, Baseline Prediction, Normalization, Dropout, Regularization, Bagging, Optimizers. Recurrent Neural Networks: Example - Financial Price Series, Financial Return Series, Financial Features, Estimation.	8

3	**Risk Management using AI and ML Models:** Introduction to financial risk management, Types of financial risk (market, credit, operational), AI and ML models for risk management (e.g., Value at Risk, Conditional Value at Risk), Case studies: Implementing risk management strategies using AI and ML.	6
4	**Portfolio Optimization and Asset Allocation Strategies:** Basics of portfolio theory, Portfolio optimization techniques (Markowitz, Black-Litterman, etc.), Application of AI and ML in portfolio optimization, Hands-on: Portfolio optimization using Python libraries.	5
5	**Credit Scoring in Finance:** Credit scoring and its importance in lending decisions, development of credit scoring models, regulation in credit scoring, Data Collection and Preprocessing for Credit Scoring, models for credit scoring-traditional, machine learning and Deep learning, Evaluation and Validation of Credit Scoring Models-ROC, AUC, etc. Case studies of credit scoring model.	6
6	**Fraud Detection in Finance:** Fraud in finance and its impact, Types of financial fraud (e.g., identity theft, payment fraud), Importance of fraud detection in financial institutions, Data Collection and Preprocessing for Fraud Detection, traditional fraud detection methods (e.g., rule-based systems, anomaly detection) and its limitations, machine learning for fraud detection, anomaly detection techniques- supervised and unsupervised, Case studies of fraud detection model.	6
	Total	39

Books Recommended:

Textbooks:

1. "AI for Finance", Edward P. K. Tsang, CRC Press, ISBN13 978-1032391205, 2023.
2. "Application of AI in Credit Scoring Modeling", Bohdan Popovych, Springer Gabler , ISBN-13 978-3658401795, 2022.
3. "Asset Allocation: From Theory to Practice and Beyond (Wiley Finance)", William Kinlaw , Mark P. Kritzman, David Turkington, Harry M. Markowitz, ISBN-13 978-1119817710, 2021.
4. "Advances in Financial Machine Learning", Marcos López de Prado, Wiley, 2018.
5. "Time Series Analysis and Its Applications: With R Examples" by Robert H. Shumway and David S. Stoffer, 2017.
6. "Python for Finance: Analyze Big Financial Data" by Yves Hilpisch, 2015.
7. "Financial Risk Management: Models, History, and Institutions" by Allan M. Malz, 2011.
8. "Portfolio Construction and Analytics" by Frank J. Fabozzi, Harry M. Markowitz, and Petter N. Kolm, 2007.

Reference books:

1. "AI In Banking & Finance: How AI Plays A Significant Role In Banking And Financial Services Industry: Artificial Intelligence Definition", Ila Sweda, ISBN-13 979-8465705233, 2021.
2. "Machine Learning in Finance: From Theory to Practice" by Matthew F. Dixon, Igor Halperin, and Paul Bilokon, Springer, ISBN-13 978-3030410674 2020.
3. "Machine Learning for Financial Engineering" by Marcos Lopez de Prado, Cambridge University Press, ISBN-13 978-1108792899, 2018.
4. "Advances in Financial Machine Learning" by Marcos Lopez de Prado, Wiley, ISBN-13 978-1119482086, 2018.
5. "Financial Analytics with R: Building a Laptop Laboratory for Data Science" by Mark J. Bennett and Dirk L. Hugen, 2016.

Online Resources:

1. What Is Artificial Intelligence in Finance? | IBM
2. How Finance & Banking Professionals Can Capitalize on AI (corporatefinanceinstitute.com)
3. AI in Finance: Applications, Examples & Benefits | Google Cloud
4. 33 Examples of AI in Finance 2024 | Built In
5. AI for portfolio management: An overview (leewayhertz.com)
6. Generative AI transforming wealth and asset management | EY - US
7. Use of Artificial Intelligence (AI) in Investment Management | Infosys BPM
8. AI-based credit scoring (leewayhertz.com)
9. Responsible AI Credit Scoring – A Lesson from Upstart.com (degruyter.com)
10. How Fraud Detection Using AI in Banking Works? | Infosys BPM
11. How Is AI Used in Fraud Detection? | NVIDIA Blog
12. (2) (PDF) Deep Learning for Time Series Forecasting: A Survey (researchgate.net)

Artificial Intelligence in Finance Laboratory (DJ19AMEL7012)	
Sr No.	**Suggested Experiments**
1	Case Study: Predicting Stock Prices with a Simple Neural Network
2	Exploratory Data Analysis (EDA) with Financial Data: Use Python libraries like Pandas and Matplotlib to analyze and visualize historical financial data. Identify trends, patterns, and correlations in stock prices, market indices, or other financial indicators.
3	Predictive Modelling for Stock Prices Build machine learning models (e.g., linear regression, decision trees, or LSTM neural networks) to predict future stock prices based on historical data. Evaluate the performance of the models using metrics like mean squared error (MSE) or accuracy.
4	Sentiment Analysis of Financial News Use natural language processing (NLP) techniques to analyze the sentiment of news articles or social media posts about specific stocks or companies. Determine the impact of sentiment on stock price movements.

5	Case Study: Research a historical example of a financial market crash. Analyze how AI might have influenced the event, for better or worse.
6	Portfolio Optimization Develop an algorithm to optimize a portfolio of stocks based on risk and return objectives. Use techniques like mean-variance optimization or Monte Carlo simulation.
7	Credit Risk Assessment Build a machine learning model to predict the creditworthiness of individuals or companies based on financial and non-financial data. Evaluate the model's performance using metrics like precision, recall, and F1-score.
8	Risk Management: Implement and backtest simple trading strategies (e.g., moving average crossover) using historical stock price data. Use Python libraries like Pandas and NumPy for data manipulation and strategy implementation.
9	Fraud Detection in Financial Transactions Develop a fraud detection model using machine learning techniques to identify fraudulent transactions in a financial dataset. Evaluate the model's performance using metrics like precision, recall, and ROC-AUC.
10	Time Series Forecasting for Financial Data Use time series forecasting models (e.g., ARIMA, Prophet) to predict future values of financial indicators like stock prices or exchange rates. Evaluate the accuracy of the forecasts using metrics like mean absolute error (MAE) or mean absolute percentage error (MAPE).

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.

Prepared by

Checked by

Department Coordinator

Principal

Program: Artificial Intelligence & Machine Learning	B.Tech.	Semester: VII
Course: Artificial Intelligence in Cyber Security (DJ19AMEC7013)		
Course: Artificial Intelligence in Cyber Security Laboratory (DJ19AMEL7013)		

Prerequisite: Artificial Intelligence, Machine Learning and Computer Network.

Course Objectives:

1. An overview of different AI and Machine Learning models in Cyber Security.
2. Using Machine Learning for effective security
3. Various attack on ML models.
4. Machine Learning and Privacy.

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

1. Understand the various concept of Cyber Security.
2. Understand the concepts in AI and Machine Learning for Cyber security.
3. Learn various AI and Machine learning models for cyber security.
4. Ability to apply AI and machine learning models in cyber security issues.

Artificial Intelligence for Cyber Security (DJ19AMEC7013)		
Unit	**Description**	**Duration**
1	**Introduction to Cyber Security:** Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.	07
2	**Artificial Intelligence in Cyber Security:** Role of AI in Cyber Security and Security Framework: Artificial Intelligence in Cyber Security, Challenges and Promises, Security Threats of Artificial Intelligence, Use-Cases: Artificial Intelligence Email Observing, Model Stealing & Watermarking, Network Traffic Analysis, Malware Analysis, United Family Healthcare by IBM.	06

3	**Machine Learning in Security:** Introduction to Machine Learning, Applications of Machine Learning in Cyber Security Domain, Machine Learning: tasks and Approaches, Anomaly Detection, Privacy Preserving Nearest Neighbour Search, Machine Learning Applied to Intrusion Detection, Online Learning Methods for Detecting Malicious Executables.	**07**
4	**Deep Learning in Security:** Introduction to deep learning, Cyber Security Mechanisms Using Deep Learning Algorithms, Applying deeplearning in various use cases, Network Cyber threat Detection.	**06**
5	**Cyber Security: Organizational Implications:** Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations. Cybercrime and Cyber terrorism: Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.	**07**
6	**Trends in Cybersecurity:** Responding to Ransomware, Combining Application development and Cybersecurity, Using Deep Learning to Detect DGA-Generated Domains Detecting Non-Malware Threats. Adaptive Honeypots and Honey tokens, Gaining a Better Understandingof How Neural Networks Work, Employing, Capsule Networks, Deep Reinforcement Learning. Protecting the IoT, Predicting the Future.	**06**
	TOTAL	**39**

Books Recommended:

Textbooks:

1. Gupta, Brij B., and Quan Z. Sheng, eds. Machine learning for computer and cyber security: principle, algorithms, and practices. CRC Press, 2019.
2. Neeraj Bhargava, Ritu Bhargava, Pramod Singh Rathore, Rashmi Agrawal, Artificial Intelligence and Data Mining Approaches in Security Frameworks Editor(s): 2021.
3. Leslie F. Sikos, AI in Cybersecurity, Springer, 2018.
4. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley, 2018.

Reference Books:

1. Alessandro Parisi Hands-On Artificial Intelligence for Cybersecurity: Implement smart AI systems for preventing cyber-attacks and detecting threats and network anomalies, Packt Publication, 2019
2. Tsai, Jeffrey JP, and S. Yu Philip, eds. Machine learning in cyber trust: security, privacy, and reliability. Springer Science & Business Media, 2009.
3. Machine Learning: A Probabilistic Perspective, Kevin P Murphy, MIT Press.
4. Christopher M. Bishop. Pattern Recognition and Machine Learning. Springer 2006.

Web Links:

1. GPU Gen AI in Cybersecurity https://www.coursera.org/learn/gen-ai-in-cybersecurity

List of Experiments:

Artificial Intelligence for Cyber Security Laboratory (DJ19AMEL7013)	
Sr. No.	**Title of the Experiment**
1	Python basics review and introduction of common data analysis libraries
2	Machine learning pipeline for cybersecurity problems Case study: spam email detection
3	Time series analysis Case study: DDoS network traffic analysis
4	A small step into deep learning and convolutional neural network (CNN) Case study: breaking Captchas with neural network
5	Dimensionality reduction and data visualization o Case study: network anomaly detection and visualization o Dataset: KDD Cup 1999 dataset (We will reuse these in lab 6)
6	Auto encoder and clustering algorithm
7	Data oversampling and decision tree algorithm o Case study: detecting and categorizing network attacks o Dataset: Kaggle credit card fraud detection dataset
8	Ensemble learning
9	Detecting Cyber security Threats with AI
10	Fraud Prevention with Cloud AI Solutions

Batch wise laboratory work of 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.

Prepared by Checked by Department Coordinator Principal

Syllabus for Final Year of B.Tech. (Common for All Programs)
Semester VII (Autonomous)
(Academic Year 2022-2023)

Program: Final Year (Common for All Programs)				**Semester: VII**					
Course: Product Life Cycle Management				**Course Code: DJ19ILO7011**					
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.**
				75			25	25	25
				Laboratory Examination			**Term work**		**Total Term work**
				Oral	**Practical**	**Oral & Practical**	**Laboratory Work**	**Tutorial / Mini project / presentation/ Journal**	
3	--	--	3	--	--	--	--	--	--

Pre-requisite: Knowledge of basic concepts of Management.

Objectives:

1. To familiarize the students with the need, benefits and components of PLM
2. To acquaint students with Product Data Management & PLM strategies
3. To give insights into new product development program and guidelines for designing and developing a product
4. To familiarize the students with Virtual Product Development

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

1. Gain knowledge about phases of PLM, PLM strategies and methodology for PLM feasibility study and PDM implementation.
2. Illustrate various approaches and techniques for designing and developing products.
3. Apply product engineering guidelines / thumb rules in designing products for moulding, machining, sheet metal working etc.
4. Acquire knowledge in applying virtual product development tools for components, machining and manufacturing plant

Syllabus for Final Year of B.Tech. (Common for All Programs)
Semester VII (Autonomous)
(Academic Year 2022-2023)

Detailed Syllabus (Unit wise)		
Unit	**Description**	**Duration in Hours**
1	**Introduction to Product Lifecycle Management (PLM):** Product Lifecycle Management (PLM), Need for PLM, Product Lifecycle Phases, Opportunities of Globalization, Pre-PLM Environment, PLM Paradigm, Importance & Benefits of PLM, Widespread Impact of PLM, Focus and Application, A PLM Project, Starting the PLM Initiative, PLM Applications **PLM Strategies:** Industrial strategies, Strategy elements, its identification, selection and implementation, Developing PLM Vision and PLM Strategy, Change management for PLM	**10**
2	**Product Design:** Product Design and Development Process, Engineering Design, Organization and Decomposition in Product Design, Typologies of Design Process Models, Reference Model, Product Design in the Context of the Product Development Process, Relation with the Development Process Planning Phase, Relation with the Post design Planning Phase, Methodological Evolution in Product Design, Concurrent Engineering, Characteristic Features of Concurrent Engineering, Concurrent Engineering and Life Cycle Approach, New Product Development (NPD) and Strategies, Product Configuration and Variant Management, The Design for X System, Objective Properties and Design for X Tools, Choice of Design for X Tools and Their Use in the Design Process	**08**
3	**Product Data Management (PDM):** Product and Product Data, PDM systems and importance, Components of PDM, Reason for implementing a PDM system, financial justification of PDM, barriers to PDM implementation **Virtual Product Development Tools:** For components, machines, and manufacturing plants, 3D CAD systems and realistic rendering techniques, Digital mock-up, Model building, Model analysis, Modelling and simulations in Product Design, Examples/Case studies	**08**
4	**Integration of Environmental Aspects in Product Design:** Sustainable Development Design for Environment, Need for Life Cycle Environmental Strategies, Useful Life Extension Strategies, End-of-Life Strategies, Introduction of Environmental Strategies into the Design Process, Life Cycle Environmental Strategies and Considerations for Product Design.	**08**
5	**Life Cycle Assessment and Life Cycle Cost Analysis:** Properties, and Framework of Life Cycle Assessment, Phases of LCA in ISO Standards, Fields of Application and Limitations of Life Cycle Assessment, Cost Analysis and the Life Cycle Approach, General Framework for LCCA, Evolution of Models for Product Life Cycle Cost Analysis	**08**

Books Recommended:

Text books:

1. Product Lifecycle Management: Paradigm for 21st Century Product Realization, John Stark, Springer-Verlag, 2004.
2. Product Design for the environment-A life cycle approach, Fabio Giudice, Guido La Rosa, Antonino Risitano, Taylor & Francis 2006.

Syllabus for Final Year of B.Tech. (Common for All Programs)
Semester VII (Autonomous)
(Academic Year 2022-2023)

Reference Books:

1. Product Life Cycle Managementl, Saaksvuori Antti, Immonen Anselmie, Springer, Dreamtech.
2. Product Lifecycle Management: Driving the next generation of lean thinking, Michael Grieve, Tata McGraw Hill, 2006.
3. Product Life-Cycle Management: Geometric Variations, François Villeneuve, Luc Mathieu, Max Giordano, Wiley, 2010.

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper based on the entire syllabus will comprise of 5 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 75 marks.
2. Total duration allotted for writing the paper is 3 hrs.

Continuous Assessment (B):

Theory:

1. Two term tests of 25 marks each 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. Average of the marks scored in both the two tests will be considered for final grading.

Syllabus for Final Year of B.Tech. (Common for All Programs)
Semester VII (Autonomous)
(Academic Year 2022-2023)

Program: Final Year (Common for All Programs)				Semester: VII						
Course: Management Information System				Course Code: DJ19ILO7012						
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.	
				75			25	25	25	100
				Laboratory Examination			Term work		Total Term work	--
3	--	--	3	Oral	Practical	Oral & Practical	Laboratory Work	Tutorial / Mini project / presentation/ Journal		
				--	--	--	--	--	--	

Objectives:

1. The course is blend of Management and Technical field.
2. Discuss the roles played by information technology in today's business and define various technology architectures on which information systems are built
3. Define and analyze typical functional information systems and identify how they meet the needs of the firm to deliver efficiency and competitive advantage
4. Identify the basic steps in systems development

Outcomes: Learner will be able to…

1. Explain how information systems Transform Business
2. Identify the impact information systems have on an organization
3. Describe IT infrastructure and its components and its current trends
4. Understand the principal tools and technologies for accessing information from databases to improve business performance and decision making
5. Identify the types of systems used for enterprise-wide knowledge management and how they provide value for businesses

Syllabus for Final Year of B.Tech. (Common for All Programs)
Semester VII (Autonomous)
(Academic Year 2022-2023)

Detailed Syllabus (Unit wise)		
Unit	**Description**	**Duration in Hours**
1	**Foundation Concepts:** Information Systems in Business, Functional Area Information System, The Components of Information Systems, Impact of IT on organizations and society, Organizational Strategy, Information systems for strategic advantage.	05
2	**Information Technologies:** Hardware and Software **Computer Systems:** End User and Enterprise Computing **Computer Peripherals:** Input, Output, and Storage Technologies **Application Software:** End User Applications **System Software:** Computer System Management **Data Resource Management:** Technical Foundations of Database Management, Managing Data Resources, Big data, Data warehouse and Data Marts, Knowledge Management **Networks:** The Networked Enterprise (Wired and wireless), Pervasive computing, Cloud Computing models	08
3	**MIS Tools and applications for Decision making:** ERP and ERP support of Business Process Reengineering, **Business intelligence (BI):** Managers and Decision Making, BI for Data analysis and Visualization **Artificial Intelligence Technologies in Business**	08
4	**Security and Ethical Challenges:** Security, Ethical, and Societal Challenges of IT Security Management of Information Technology	06
5	**Social Computing (SC):** Web 2.0 and 3.0, SC in business-shopping, Marketing, Operational and Analytic CRM, E-business and E-commerce – B2B B2C, Mobile commerce.	07
6	**Information System within Organization:** Acquiring Information Systems and Applications: Various System development life cycle models. **Enterprise and Global Management of Information Technology:** Managing Information Technology, Managing Global IT.	08

Books Recommended:

Reference Books:

1. Management Information Systems, 11th edition by James A O'Brien, George M., Ramesh Behl.
2. Kelly Rainer, Brad Prince, Management Information Systems, Wiley.
3. K.C. Laudon and J.P. Laudon, Management Information Systems: Managing the Digital Firm, 10th Ed., Prentice Hall, 2007.
4. D. Boddy, A. Boonstra, Managing Information Systems: Strategy and Organization, Prentice Hall, 2008

Syllabus for Final Year of B.Tech. (Common for All Programs)
Semester VII (Autonomous)
(Academic Year 2022-2023)

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper based on the entire syllabus will comprise of 5 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 75 marks.
2. Total duration allotted for writing the paper is 3 hrs.

Continuous Assessment (B):

Theory:

1. Two term tests of 25 marks each 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. Average of the marks scored in both the two tests will be considered for final grading.

Syllabus for Final Year of B.Tech. (Common for All Programs)
Semester VII (Autonomous)
(Academic Year 2022-2023)

Program: Final Year (Common for All Programs)				**Semester: VII**						
Course: Operations Research				**Course Code: DJ19ILO7013**						
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.**	
				75			25	25	25	100
				Laboratory Examination			**Term work**		**Total Term work**	
				Oral	**Practical**	**Oral & Practical**	**Laboratory Work**	**Tutorial / Mini project / presentation/ Journal**		
3	--	--	3	--	--	--	--	--	--	--

Pre-requisites: Basic Knowledge of Algebra, Probability and Statistics.

Objectives:

1. To formulate a real-world decision problem as a mathematical programming model.
2. To learn the mathematical tools that are employed to solve mathematical programming models.

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

1. **Convert** a real-world problem in to a Linear Programming Problem and **analyse** the solution obtained using Simplex method or other algorithms.
2. **Identify** real-world problems as Transportation Problem and Assignment Problem and **Solve** the decision problem by choosing appropriate algorithm.
3. **Identify** the decision situations which vary with time and **analyse** them using principle of dynamic programming to real life situations.
4. **Explain** reasons of formation of queues, classify various queuing systems and **apply** parameters defined for various queuing systems for decision making in real life situations.
5. **Understand** the concept of decision making in situation of competition and **recommend** strategies in case of two-person zero sum games.
6. **Describe** concept of simulation and **apply** Monte Carlo Simulation technique to systems such as inventory, queuing and **recommend** solutions for them.
7. **Understand** need for right replacement policy and **determine** optimal replacement age.

Syllabus for Final Year of B.Tech. (Common for All Programs)
Semester VII (Autonomous)
(Academic Year 2022-2023)

Detailed Syllabus (Unit wise)		
Unit	**Description**	**Duration in Hours**
1	**Introduction to Operations Research:** Concept of decision making. Definition of OR. Formulation of decision problem as OR model, Concept of Optimization, **Linear Programming Problem:** Mathematical Formulation. Finding optimal solution - Graphical method, Simplex Method, Big M-method, Two Phase Method. Duality, Primal – Dual construction, Symmetric and Asymmetric Dual. Dual Simplex Method.	10
2	**Assignment Problems:** Mathematical Formulation, Finding optimal solution - Hungarian Method **Transportation problem:** Mathematical Formulation, Finding initial basic feasible solution – Northwest corner rule, row minima, column minima, least cost method and Vogel's approximation method. Optimality test: the stepping stone method and MODI method. Improving the solution.	08
3	**Dynamic Programming**: Bellman's Principle of optimality - Applications of dynamic programming- Employment smoothening problem, capital budgeting problem, shortest path problem, cargo loading problem	06
4	**Queuing Models:** Characteristics of queuing models. Single Channel – Single and multi phase servers, Poisson arrivals, exponential service time - with infinite population and finite population models – with infinite and finite capacity. Multichannel – Single phase server - Poisson arrivals, exponential service time with infinite population. **Game Theory:** Introduction. Minimax & Maximin Criterion and optimal strategy. Solution of games with saddle points, rectangular games without saddle points - 2 x 2 games, dominance principle. Approximate methods - Iterative method, m x 2 & 2 x n games -Graphical method and method of sub-games. Expressing game as LPP.	10
5	**Simulation:** Definition. Types of simulation models. Monte Carlo simulation technique. Applications of simulation - Inventory and Queuing problems. Simulation Languages. **Replacement Models:** Replacement of items that deteriorate with time - when money value is not counted and counted, Replacement of items that fail suddenly – individual and group replacement policy.	08

Note: Educator is expected to introduce relevant software available for solving various mathematical models.

Books Recommended:

Text books:

1. Operations Research, Sharma J. K., Trinity Press
2. Operations Research, Gupta P. K., Hira D. S., S. Chand Limited

Reference Books:

1. Operations Research - An Introduction; Taha, H.A.; Prentice Hall

2. Operations Research: Principles and Practice; Ravindran, A, Phillips, D. T and Solberg, J. J.; John Willey and Sons
3. Introduction to Operations Research; Hiller, F. S. and Liebermann, G. J.; Tata McGraw Hill
4. Operations Research Principles and Practice; Pradeep Prabhakar Pai; Oxford University Press
5. Operations Research, R. Panneerselvam, PHI Publications.
6. Operations Research, A. M. Natarajan, P. Balasubramani, A. Tamilarasi, Pearson Education.
7. Operations Research; Kanti Swarup, P. K. Gupta and Man Mohan; Sultan Chand & Sons

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper based on the entire syllabus will comprise of 5 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 75 marks.
2. Total duration allotted for writing the paper is 3 hrs.

Continuous Assessment (B):

Theory:

1. Two term tests of 25 marks each 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. Average of the marks scored in both the two tests will be considered for final grading.

Syllabus for Final Year of B.Tech. (Common for All Programs)
Semester VII (Autonomous)
(Academic Year 2022-2023)

Program: Final Year (Common for All Programs)				Semester: VII						
Course: Cyber Security and Laws				Course Code: DJ19ILO7014						
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.	
				75			25	25	25	100
				Laboratory Examination			Term work		Total Term work	--
3	--	--	3	Oral	Practical	Oral & Practical	Laboratory Work	Tutorial / Mini project / presentation/ Journal		
				--	--	--	--	--	--	

Objectives:

1. To understand and identify different types cybercrime and cyber offences.
2. To recognized Indian IT Act 2008 and its latest amendments
3. To learn various types of security standards compliances

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

1. Understand the different types of cybercrime and security issues E Business.
2. Analyses different types of cyber threats and techniques for security management.
3. Explore the legal requirements and standards for cyber security in various countries to regulate cyberspace.
4. Impart the knowledge of Information Technology Act and legal frame work of right to privacy, data security and data protection.

Syllabus for Final Year of B.Tech. (Common for All Programs)
Semester VII (Autonomous)
(Academic Year 2022-2023)

Detailed Syllabus (Unit wise)		
Unit	**Description**	**Duration in Hours**
1	**Introduction to Cybercrime:** Cyber Crime, Cyber Law, Cyber Security, History of Cyber Crime, Hacking, Data Theft, Cyber Terrorism, Virus & Worm's, Email Bombing, Pornography, online gambling, Forgery, Web Defacements, Web Jacking, Illegal online Selling, Cyber Defamation, Software Piracy, Electronics/ Digital Signature, Phishing, Password Cracking, Key loggers and Spywares, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Over Flow, Attacks on Wireless Networks, Phishing Identity Theft (ID Theft) **Cyber offenses:** How criminal plan the attacks, Social Engineering, Cyber stalking, Cyber café and Cybercrimes, Botnets, Attack vector	**12**
2	**Cyber Threats Analysis** Knowledge of Dynamic and Deliberate Targeting Knowledge of Indications and Warning Knowledge of Internal Tactics to Anticipate and/or, Emulate Threat Capabilities and Actions Knowledge of Key Cyber Threat Actors and their Equities Knowledge of Specific Target Identifiers and Their Usage **Cyber Security Management** Knowledge of Emerging Security Issues, Risks, and Vulnerabilities	**08**
3	**Electronic Business and legal issues** Evolution and development in Ecommerce, Policy Frameworks for Secure Electronic Business, paper vs paper less contracts, E-Commerce models- B2B, B2C, E security. E-Payment Mechanism; Payment through card system, E-Cheque, E-Cash, E-Payment Threats & Protections, Security for E-Commerce.	**06**
4	**Indian IT Act** Cyber Crime and Criminal Justice, Penalties, Adjudication and Appeals Under the IT Act, 2000, IT Act. 2008 and its Amendments **Security aspect in cyber Law** The Contract Aspects in Cyber Law , The Security Aspect of Cyber Law, The Intellectual Property Aspect in Cyber Law ,The Evidence Aspect in Cyber Law ,The Criminal Aspect in Cyber Law	08
5	**Security Industries Standard Compliances** IT Security v/s IT Compliance, Cyber Security Standards, critical security controls for cyber security, GRC (Governance, Risk Management, and Compliance), SOX, GLBA, HIPAA, ISO/IEC 27001, NIST Cyber Security Framework (CSF), PCI-DSS. OWASP Top Ten Project, GDPR (General Data Protection Regulation), NIST (National Institute of Standards and Technology), CIS Controls (Center for Internet Security Controls)	08

Syllabus for Final Year of B.Tech. (Common for All Programs)
Semester VII (Autonomous)
(Academic Year 2022-2023)

Books Recommended:

Reference Books and Material:

1. Nina Godbole, Sunit Belapure, Cyber Security, Wiley India, New Delhi
2. The Indian Cyber Law by Suresh T. Vishwanathan; Bharat Law House New Delhi
3. The Information Technology Act, 2000; Bare Act- Professional Book Publishers, New Delhi.
4. E-Commerce Security and Privacy", Anup K. Ghosh, Springer Science and Business Media, 2012
5. Izzat Alsmadi , The NICE Cyber Security Framework Cyber Security Intelligence and Analytics, Springer
6. Cyber Law & Cyber Crimes, Advocate Prashant Mali; Snow White Publications, Mumbai
7. Nina Godbole, Information Systems Security, Wiley India, New Delhi
8. Kennetch J. Knapp, Cyber Security &Global Information Assurance Information Science Publishing.
9. William Stallings, Cryptography and Network Security, Pearson Publication
10. Websites for more information is available on : The Information Technology ACT, 2008- TIFR : https://www.tifrh.res.in
11. Website for more information, A Compliance Primer for IT professional: https://www.sans.org/reading-room/whitepapers/compliance/compliance-primer-professionals-33538

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper based on the entire syllabus will comprise of 5 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 75 marks.
2. Total duration allotted for writing the paper is 3 hrs.

Continuous Assessment (B):

Theory:

1. Two term tests of 25 marks each 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. Average of the marks scored in both the two tests will be considered for final grading.

Syllabus for Final Year of B.Tech. (Common for All Programs)
Semester VII (Autonomous)
(Academic Year 2022-2023)

Program: Final Year (Common for All Programs)				Semester: VII						
Course: Personal Finance Management				Course Code: DJ19ILO7015						
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.	
				75			25	25	25	100
				Laboratory Examination			Term work		Total Term work	
3	--	--	3	Oral	Practical	Oral & Practical	Laboratory Work	Tutorial / Mini project / presentation/ Journal		--
				--	--	--	--	--	--	

Pre-requisites: Basic Knowledge of Algebra, Probability and Statistics.

Objectives:

1. To create awareness and educate consumers on access to financial services.
2. To make the students understand the basic concepts, definitions and terms related to direct taxation.
3. To help the students compute the Goods and Service Tax (GST) payable by a supplier after considering the eligible input tax credit.
4. To familarise the students with microfinance for accelerating the expansion of local microbusinesses.

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

1. Use a framework for financial planning to understand the overall role finances play in his/her personal life.
2. Compute income from salaries, house property, business/profession, capital gains and income from other sources.
3. Compute the amount of CGST, SGST and IGST payable after considering the eligible input tax credit.
4. Understand how Microfinance can help in financial inclusion.

Syllabus for Final Year of B.Tech. (Common for All Programs)
Semester VII (Autonomous)
(Academic Year 2022-2023)

Detailed Syllabus (Unit wise)		
Unit	**Description**	**Duration in Hours**
01	**Overview of Indian Financial System:** Characteristics, Components and Functions of Financial System. Financial Instruments and Financial Markets, Financial inclusion. **Introduction to Personal Finance** Person Financial Planning in Action, Money Management Skills, Taxes in Your Financial Plan, Savings and Payment Services. Consumer Credit: Advantages, Disadvantages, Sources and Costs.	**07**
02	**Personal Financial Management** **Loans:** Home, Car, Education, Personal, Loan against property and Jewel loan. **Insurance:** Types of Insurance – ULIP and Term; Health and Disability Income Insurance, Life Insurance. **Investment:** Investing Basics and Evaluating Bonds, Investing in Stocks and Investing in Mutual Funds, Planning for the Future.	**07**
03	**Income Tax** **Income Tax Act Basics-** Introduction to Income Tax Act, 1961 **Heads of Income and Computation of Total Income and Tax Liability-** Heads of Income and Computation of Total Income under various heads, Clubbing Provisions, Set off and Carry forward of Losses, Deductions, Assessment of Income and tax liability of different persons. **Tax Management, Administrative Procedures and ICDS -** TDS, TCS and Advance Tax Administrative Procedures, ICDS.	**08**
04	**Goods and Services Tax** GST Constitutional framework of Indirect Taxes before GST (Taxation Powers of Union & State Government); Concept of VAT: Meaning, Variants and Methods; Major Defects in the structure of Indirect Taxes prior to GST; Rationale for GST; Structure of GST (SGST, CGST, UTGST & IGST); GST Council, GST Network, State Compensation Mechanism, Registration. **Levy and Collection of GST** Taxable event- "Supply" of Goods and Services; Place of Supply: Within state, Interstate, Import and Export; Time of supply: Valuation for GST- Valuation rules, taxability of reimbursement of expenses; Exemption from GST: Small supplies and Composition Scheme: Classification of Goods and Services	**10**
05	**Introduction to Micro – finance** Micro-Finance: Definitions, Scope & Assumptions, Types of Microfinance, Customers of Micro-finance, Credit Delivery Methodologies, SHG concept, origin, Formation & Operation of Self Help Groups (SHGs). **Models in Microfinance** - Joint Liability Groups (JLG), SHG Bank Linkage Model and GRAMEEN Model: Achievements & Challenges, **Institutional Mechanism** Current Challenges for Microfinance, Microfinance Institutions (MFIs): Constraints & Governance Issues, Institutional Structure of Microfinance in India :NGO-MFIs, NBFC-MFIs, Co-operatives, Banks, Microfinance Networks and Associations; Demand & Supply of Microfinance Services in India, Impact assessment and social assessments of MFIs,	**10**

Syllabus for Final Year of B.Tech. (Common for All Programs)
Semester VII (Autonomous)
(Academic Year 2022-2023)

Books Recommended:

Reference Books:

1. Banking and Financial Sector Reforms in India , by Asha Singh, M.S. Gupta, Serials Publication.
2. Indian Banking Sector: Essays and Issues (1st) , by M.S. Gupta & J.B. Singh, Serials Publication.
3. Basics Of Banking & Finance , by K.M. Bhattacharya O.P. Agarwal , Himalaya Publishing House
4. Agricultural Finance And Management, by S. Subba Reddy , P. Raghu Ram .
5. The Indian Financial System And Development , by Dr.Vasant Desai, Himalaya Publishing House; Fourth Edition
6. Income Tax Management , Simple Way of Tax Management, Tax Planning and Tax Saving , By Sanjay Kumar Satapathy
7. Direct Tax System Income Tax by Dr. R. K. Jain, SBPD Publications.
8. Simplified Approach to GST Goods and Services Tax, By S K Mishra , Educreation Publishing.
9. Introduction To Microfinance , By Todd A Watkins , World Scientific Publishing Company

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper based on the entire syllabus will comprise of 5 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 75 marks.
2. Total duration allotted for writing the paper is 3 hrs.

Continuous Assessment (B):

Theory:

1. Consisting **One Class Tests for 25 marks** based on approximately 50% of contents and one case study with presentations for 25 Marks.
2. Total duration allotted for writing test paper is 1 hr.
3. Average of the marks scored in the tests and case study will be considered for final grading.

Syllabus for Final Year of B.Tech. (Common for All Programs)
Semester VII (Autonomous)
(Academic Year 2022-2023)

Program: Final Year (Common for All Programs)				Semester: VII						
Course: Energy Audit and Management				Course Code: DJ19ILO7016						
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.	
				75			25	25	25	100
				Laboratory Examination			Term work		Total Term work	--
3	--	--	3	Oral	Practical	Oral & Practical	Laboratory Work	Tutorial / Mini project / presentation/ Journal		
				--	--	--	--	--	--	

Objectives:

1. To understand the importance of energy security for sustainable development and the fundamentals of energy conservation.
2. To identify and describe the basic principles and methodologies adopted in energy audit of a utility
3. To introduce performance evaluation criteria of various electrical and thermal installations to facilitate the energy management.
4. To relate the data collected during performance evaluation of systems for identification of energy saving opportunities.

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

1. To identify and describe present state of energy security and its importance.
2. To identify and describe the basic principles and methodologies adopted in energy audit of a utility.
3. To describe the energy performance evaluation of some common electrical installations and identify the energy saving opportunities.
4. To describe the energy performance evaluation of some common thermal installations and identify the energy saving opportunities.
5. To analyze the data collected during performance evaluation and recommend energy saving measures.

Syllabus for Final Year of B.Tech. (Common for All Programs)
Semester VII (Autonomous)
(Academic Year 2022-2023)

Detailed Syllabus (Unit wise)		
Unit	**Description**	**Duration in Hours**
01	**Energy Scenario:** Present Energy Scenario, Energy Pricing, Energy Sector Reforms, Energy Security, Energy Conservation and its Importance, Energy Conservation Act-2001 and its Features. Basics of Energy and its various forms, Material and Energy balance.	**05**
02	**Energy Audit:** Definition, Energy audit- need, Types of energy audit, Energy management (audit) approach-understanding energy costs, Bench marking, Energy performance, matching energy use to requirement, Maximizing system efficiencies, Optimizing the input energy requirements, Fuel and energy substitution. Elements of monitoring & targeting, Energy audit instruments. Technical and economic feasibility, Classification of energy conservation measures. Safety considerations during energy audit. **Financial analysis techniques:** Simple payback period, NPV, Return on investment (ROI) Internal rate of return (IRR).	**10**
03	**Energy Management and Energy Conservation in Electrical System:** Electricity billing, Electrical load management and maximum demand Control; Power factor improvement, Energy efficient equipments and appliances, star ratings. Energy efficiency measures in lighting system, lighting control: Occupancy sensors, daylight integration, and use of intelligent controllers. Energy conservation opportunities in water pumps, compressor, fan and blower. industrial drives, induction motors, motor retrofitting, soft starters, variable speed drives.	**10**
04	**Energy Management and Energy Conservation in Thermal Systems:** Review of different thermal loads; Energy conservation opportunities in: Steam distribution system, Steam leakages, Steam trapping, Condensate and flash steam recovery system. Waste heat recovery, use of insulation- types and application. Energy conservation opportunities in: Boiler system. Refrigeration system and HVAC system.	**10**
05	**Energy conservation in Buildings**: Energy Conservation Building Codes (ECBC): Green Building, LEED rating, Application of Non-Conventional and Renewable Energy Sources, Energy sources and energy management in electric vehicles.	**07**

Books Recommended:

Reference Books:

1. Handbook of Electrical Installation Practice, Geofry Stokes, Blackwell Science.
2. Designing with light: Lighting Handbook, By Anil Valia, Lighting System.
3. Energy Management Handbook, By W.C. Turner, John Wiley and Sons.
4. Handbook on Energy Audits and Management, edited by A. K. Tyagi, Tata Energy Research Institute (TERI).
5. Energy Management Principles, C.B. Smith, Pergamon Press.
6. Energy Conservation Guidebook, Dale R. Patrick, S. Fardo, Ray E. Richardson, Fairmont Press.
7. Handbook of Energy Audits, Albert Thumann, W. J. Younger, T. Nichus, CRC Press.
8. *www.energymanagertraining.com*
9. *www.bee-india.nic.in*

Syllabus for Final Year of B.Tech. (Common for All Programs)
Semester VII (Autonomous)
(Academic Year 2022-2023)

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper based on the entire syllabus will comprise of 5 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 75 marks.
2. Total duration allotted for writing the paper is 3 hrs.

Continuous Assessment (B):

Theory:

1. Consisting of **Two Compulsory Class Tests for 25 marks**, First test based on approximately 40% of contents and second test based on remaining contents (approximately 40% but excluding contents covered in Test I)
2. Total duration allotted for writing each of the paper is 1 hr.
3. Average of the marks scored in both the tests will be considered for final grading.

Syllabus for Final Year of B.Tech. (Common for All Programs)
Semester VII (Autonomous)
(Academic Year 2022-2023)

<table>
<tr><td colspan="8">Program: Final Year (Common for All Programs)</td><td colspan="3">Semester: VII</td></tr>
<tr><td colspan="8">Course: Disaster Management and Mitigation Measures</td><td colspan="3">Course Code: DJ19ILO7017</td></tr>
<tr><td colspan="4" rowspan="3">Teaching Scheme (Hours / week)</td><td colspan="7">Evaluation Scheme</td></tr>
<tr><td colspan="3">Semester End Examination Marks (A)</td><td colspan="3">Continuous Assessment Marks (B)</td><td rowspan="2">Total marks (A+ B)</td></tr>
<tr><td rowspan="2">Lectures</td><td rowspan="2">Practical</td><td rowspan="2">Tutorial</td><td rowspan="2">Total Credits</td><td colspan="3">Theory</td><td>Term Test 1</td><td>Term Test 2</td><td>Avg.</td></tr>
<tr><td colspan="3">75</td><td>25</td><td>25</td><td>25</td><td>100</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">--</td><td rowspan="2">--</td><td rowspan="2">3</td><td colspan="3">Laboratory Examination</td><td colspan="2">Term work</td><td rowspan="2">Total Term work</td><td rowspan="2">--</td></tr>
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<tr><td>--</td><td>--</td><td>--</td><td>--</td><td>--</td><td>--</td><td>--</td></tr>
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Objectives:

1. To provide basic understanding hazards, disaster and various types and categories of disaster occurring around the world.
2. To identify extent and damaging capacity of a disaster.
3. To study and understand the means of losses and methods to overcome /minimize it.
4. To understand roles and responsibilities of individual and various organization during and after disaster.
5. To appreciate the significance of GIS, GPS in the field of disaster management.
6. To understand the emergency government response structures before, during and after disaster.

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

1. Know natural as well as manmade disaster and their extent and possible effects on the economy.
2. Know the institutional framework and organization structure in India for disaster management and get acquainted with government policies, acts and various emergency laws.
3. Get to know the simple dos and don'ts in such extreme events and build skills to respond accordingly.
4. Understand the importance of disaster prevention and various mitigation measure with the exposure to disasters hotspots across the globe.

Syllabus for Final Year of B.Tech. (Common for All Programs)
Semester VII (Autonomous)
(Academic Year 2022-2023)

Detailed Syllabus (Unit wise)		
Unit	**Description**	**Duration in Hours**
1	**General Information about Disaster:** Brief concept of Hazards, definition and types of Disasters – Natural, Man-made, and hybrid, Groups of Disasters- Natural and Technological, global Scenario, Significance of studying various aspects of disasters, effects of disasters, India's vulnerability to disasters, Impact of disaster on National development. Study of Natural disasters: Flood, drought, cloud burst, Earthquake, Landslides, Avalanches, Volcanic eruptions, Mudflow, Cyclone, Storm, Storm Surge, climate change, global warming, sea level rise, ozone depletion etc. Study of Human/Technology Induced Disasters: Chemical, Industrial and Nuclear disasters, Internally displaced persons, road and train accidents Fire Hazards, terrorism, militancy, Role of growing population and subsequent industrialization, urbanization and changing lifestyle of human beings in frequent occurrences of manmade disasters.	**10**
2	**Disaster Management:** Brief Introduction, Disaster management cycle, Evolution of Disaster and Disaster management in India, Disaster management acts, policies and guidelines, laws of emergencies etc. Prior, During and Post disaster management activities: (Preparedness, strengthening emergency centers, Logistics, optimum resource management, emergency response and relief, Training, Public awareness, Research, Reconstruction of essential services and livelihood restoration.	**08**
3	**Institutional framework and Mechanism for disaster management in India:** Institutions in India for dealing with various disasters, Organizational structure, functions and responsibilities of National Institute of Disaster Management (NIDM) and National disaster management authority (NDMA) in India, roles and responsibilities of central and state government during and after disaster, NGO's involved in disasters and their task, Jobs carried out by armed forces. Financial Relief During disaster (State, National and International Disaster Assistance)	**08**
4	**Disaster risk reduction and Mitigation Measures:** Need of disaster prevention and mitigation, mitigation guiding principles, challenging areas, structural and non-structural measures for disaster risk reduction. Mitigation measures for flood, earthquake, cyclone monitoring, air quality, water quality, climate change, land use, winter storms and aquatic biology etc. Use of information management, GIS, GPS and remote sensing Mitigation measure. Do's and don'ts in case of disasters and effective implementation of relief aids.	**08**
5	**Case studies on disaster (National /International):** Case study discussion of Hiroshima – Nagasaki (Japan), India – Tsunami (2004) , Bhopal gas tragedy, Kerala and Uttarakhand flood disaster, Cyclone Phailin (2013), Fukushima Daiichi nuclear disaster (2011), 26th July 2005 Mumbai flood, Chernobyl meltdown and so on. (Discuss case studies on disaster with respect to reason for the disaster, incidents, effects of disaster, present scenario and safety measures taken)	**08**

Books Recommended:

Reference Books and Reports:

1. Disaster Management, by Harsh K.Gupta, Universities Press Publications (2003).
2. Disaster Management: An Appraisal of Institutional Mechanisms in India, by O.S.Dagur, published by Centre for land warfare studies, New Delhi, 2011.
3. Introduction to International Disaster Management, by Damon Copolla, Butterworth Heinemann Elsevier Publications (2015).
4. Disaster Management Handbook, by Jack Pinkowski, CRC Press, Taylor and Francis group (2008).
5. Disaster management & rehabilitation, by Rajdeep Dasgupta, Mittal Publications, New Delhi (2007).
6. Natural Hazards and Disaster Management, Vulnerability and Mitigation, by R B Singh, Rawat Publications (2006).
7. Concepts and Techniques of GIS, by C.P.Lo Albert, K.W. Yonng, Prentice Hall (India) Publications (2006).
8. Risk management of natural disasters, by Claudia G. Flores Gonzales, KIT Scientific Publishing (2010).
9. Disaster Management – a disaster manger's handbook, by W. Nick Carter, Asian Development Bank (2008).
10. Disaster Management in India, by R. K. Srivastava, Ministry of Home Affairs, GoI, New Delhi (2011)
11. The Chernobyl Disaster: Legacy and Impact on the Future of Nuclear Energy, by Wil Mara, Marshall Cavendish Corporation, New York, 2011.
12. The Fukushima 2011 Disaster, by Ronald Eisler, Taylor & Francis, Florida, 2013.

(Learners are expected to refer reports published at national and international level and updated information available on authentic web sites)

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper based on the entire syllabus will comprise of 5 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 75 marks.
2. Total duration allotted for writing the paper is 3 hrs.

Continuous Assessment (B):

Theory:

1. Two term tests of 25 marks each 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. Average of the marks scored in both the two tests will be considered for final grading.

Syllabus for Final Year of B.Tech. (Common for All Programs)
Semester VII (Autonomous)
(Academic Year 2022-2023)

Program: Final Year (Common for All Programs)				Semester: VII						
Course: Science of Well-being				Course Code: DJ19ILO7018						
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.	
				75			25	25	25	100
				Laboratory Examination			Term work		Total Term work	--
3	--	--	3	Oral	Practical	Oral & Practical	Laboratory Work	Tutorial / Mini project / presentation/ Journal		
				--	--	--	--	--	--	

Objectives:

1. To create consciousness about importance of holistic health and physical as well as mental well-being.
2. To make learners aware of the concepts of Happiness, Gratitude, Self-Compassion, Empathy etc.
3. To introduce the learners to the means of mental and physical well-being, ill effects of mal-practices like alcoholism, smoking etc.
4. To equip the learners to manage and cope up with stress in their daily living.

Outcomes: Upon Completion of the course, the learner should be able to:

1. Describe concepts of holistic health and well-being, differentiate between its true meaning and misconceptions and understand the benefits of well-being.
2. Recognize meaning of happiness, practice gratitude and self-compassion and analyze incidents from one's own life.
3. Understand the causes and effects of stress, identify reasons for stress in one's own surrounding and self.
4. Recognize the importance of physical health and fitness, assess their life style and come up with limitations or effectiveness.
5. Inspect one's own coping mechanism, assess its effectiveness, develop and strategize for betterment and execute it.

Syllabus for Final Year of B.Tech. (Common for All Programs)
Semester VII (Autonomous)
(Academic Year 2022-2023)

Detailed Syllabus (Unit wise)		
Unit	**Description**	**Duration in Hours**
1	**Health and well-being:** The concept of health, dimensions of health, the notion of well-being, various facets of well-being, relation between health and well-being. Concept of holistic health, its principles and importance, concept and benefits of holistic care, misconceptions about holistic health approach, the application of a true holistic approach to our well-being.	06
2	**Concepts of happiness:** Happiness: what is it and how do we measure it? Philosophical perspectives on happiness, Happiness: Nature or Nurture? Happiness in the modern world: impediments and accelerators, Narrow vs. Broad Band Approaches to Happiness, Benefits of Happiness, Self-Compassion and Gratitude. Misconceptions of happiness.	08
3	**Stress and mental health/well-being**: Nature and concept of stress, meaning and definitions of stress, types of stress, meaning of stressors, types of stressors, symptoms of stress, effects of stress, different models of stress. Sources of stress and how does stress cause illness, various sources of stress, delineate between external and internal sources of stress, differentiate between continuous and discrete stressors, the effects of these stressors on health and well-being, diversity of stressors and their health consequences, relation between stress and illness from different perspectives association between stress related physiological mechanisms and different illnesses.	10
4	**Physical Well-being / Health management:** concept of health behaviours, dimensions of health behaviours. Health enhancing behaviors: Exercise and Weight control, application and importance of these health enhancing behaviours. Health protective behaviors and illness management: concept of illness management, effectiveness of illness management. Concept of Nutrition, Role of Nutrition, Components of Nutrition, concept of Malnutrition, Health compromising behaviours: Alcoholism, Smoking and its effects on health.	10
5	**Dealing with Difficult Times / Coping mechanisms:** The concept of chronic stress, Health and safety risks of chronic stress, Forms and Treatment of chronic stress, Coping with Acute and Chronic stress, theories of the stress-illness link, role of stress in mental disorders. Concept of coping, Ways of coping and stress management, basic knowledge about stress management, various techniques of stress management, stress management programs. Mental strengths and virtues, Hope, Optimism, Resilience – concept, pathways and models, Meditation and Self-introspection.	08

Books Recommended:

Textbooks:

1. The Science of well-being by Felicia Huppert, Nick Baylis, Barry Keverne; Oxford University Press
2. Health and Well-Being: Emerging Trends by S. Ojha, U. Rani Srivastava, Shobhna Joshi, Global Vision Publishing House
3. Positive psychology: The scientific and practical explorations of human strengths by Shane J. Lopez, Jennifer Teramoto Pedrotti, Charles Richard Snyder; Sage Publications.

Syllabus for Final Year of B.Tech. (Common for All Programs)
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Reference Books:

1. The pursuit of happiness and the realization of sympathy: Cultural patterns of self, social relations, and well-being by Kitayama, S., & Markus, H. R, Culture and subjective well-being, The MIT Press.
2. Man Adapting by Dubos, R; New Haven: Yale University Press.
3. Happiness a history by McMahon D. M., Atlantic Monthly Press.
4. Well-being: The foundations of hedonic psychology by D. Kahneman & E. Diener & N. Schwarz, New York: Russell Sage
5. Selye H. The Stress of Life. New York; McGraw-Hill; 1984.

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper based on the entire syllabus will comprise of 5 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 75 marks.
2. Total duration allotted for writing the paper is 3 hrs.

Continuous Assessment (B):

Theory:

1. Two term tests of 25 marks each 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. Average of the marks scored in both the two tests will be considered for final grading.

Syllabus for Final Year of B.Tech. Program in Mechanical Engineering:
Semester VII (Autonomous)
(Academic Year 2022-2023)

Program: Final Year Mechanical Engineering				**Semester: VII**					
Course: Research Methodology				**Course Code: DJ19ILO7019**					
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.**
				75			25	25	25
				Laboratory Examination			**Term work**		**Total Term work**
3	--	--	3	**Oral**	**Practical**	**Oral & Practical**	**Laboratory Work**	**Tutorial / Mini project / presentation/ Journal**	
				--	--	--	--	--	--

Pre-requisites: Basic Knowledge of Probability and Statistics.

Objectives:

1. To understand Research and Research Process
2. To acquaint learners with identifying problems for research and develop research strategies
3. To familiarize learners with the techniques of data collection, analysis of data and interpretation

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

1. Prepare a preliminary research design for projects in their subject matter areas
2. Accurately collect, analyze and report data
3. Present complex data or situations clearly
4. Review and analyze research findings
5. Write report about findings of research carried out

Syllabus for Final Year of B.Tech. Program in Mechanical Engineering:
Semester VII (Autonomous)
(Academic Year 2022-2023)

Detailed Syllabus (Unit wise)		
Unit	**Description**	**Duration in Hours**
1	**Basic Research Concepts** Meaning of research, Objectives of research, Types of research, Significance of research Research process	07
2	**Research Methodology:** Identification of research problem, Literature review, Formulation of hypothesis, Formulation of Research design.	10
3	**Research and Sample Design:** Meaning of research and sample design, Need of research design, Features of good research design, Important concepts, Different research designs, Types of sampling designs	10
4	**Data Collection and Data Analysis:** Types of data, Methods for collecting data: Experiments and surveys, Collection of primary and secondary data, Hypothesis testing and interpretation of Data	10
5	**Interpretation and Report Writing:** Interpretation and drawing conclusions on the research, Preparation of the report, Ethical Issues	05

Books Recommended:

Reference Books:

1. Dawson, Catherine, 2002, Practical Research Methods, New Delhi, UBS Publishers Distributors.
2. Kothari, C.R.,1985, Research Methodology-Methods and Techniques, New Delhi, Wiley Eastern Limited.
3. Kumar, Ranjit, 2005, Research Methodology-A Step-by-Step Guide for Beginners, (2nd Edition), Singapore, Pearson Education

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper based on the entire syllabus will comprise of 5 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 75 marks.
2. Total duration allotted for writing the paper is 3 hrs.

Continuous Assessment (B):

Theory:

1. Two term tests of 25 marks each 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. Average of the marks scored in both the two tests will be considered for final grading.

Syllabus for Final Year of B.Tech. (Common for All Programs)
Semester VII (Autonomous)
(Academic Year 2022-2023)

<table>
<tr><td colspan="8">Program: Final Year (Common for All Programs)</td><td colspan="4">Semester: VII</td></tr>
<tr><td colspan="8">Course: Public Systems and Policies</td><td colspan="4">Course Code: DJ19ILO7020</td></tr>
<tr><td colspan="4" rowspan="2">Teaching Scheme (Hours / week)</td><td colspan="8">Evaluation Scheme</td></tr>
<tr><td colspan="3">Semester End Examination Marks (A)</td><td colspan="4">Continuous Assessment Marks (B)</td><td rowspan="2">Total marks (A+ B)</td></tr>
<tr><td rowspan="3">Lectures</td><td rowspan="3">Practical</td><td rowspan="3">Tutorial</td><td rowspan="3">Total Credits</td><td colspan="3">Theory</td><td>Term Test 1</td><td>Term Test 2</td><td>Avg.</td></tr>
<tr><td colspan="3">75</td><td>25</td><td>25</td><td>25</td><td>100</td></tr>
<tr><td colspan="3">Laboratory Examination</td><td colspan="2">Term work</td><td rowspan="2">Total Term work</td><td rowspan="3">--</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">--</td><td rowspan="2">--</td><td rowspan="2">3</td><td>Oral</td><td>Practical</td><td>Oral & Practical</td><td>Laboratory Work</td><td>Tutorial / Mini project / presentation/ Journal</td></tr>
<tr><td>--</td><td>--</td><td>--</td><td>--</td><td>--</td><td>--</td></tr>
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Pre-requisites: Basic Knowledge of Social science and Current affairs

Objectives:

1. To analyze the transformations in public systems with emphasis on current initiatives and emerging challenges in the field.
2. To understand public systems in a fast-changing environment in the global context.
3. To provide an in-depth understanding of the ills prevailing in the society and aids to identify the solutions for them.
4. To explain public policy and its operations with special focus on policy relating to Government finance.
5. To analyze and evaluate the impact of the public policy on firms and economy at large.

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

1. Understand the importance of public systems in a fast-changing environment in the global context.
2. Analyze the transformations in public systems with emphasis on current initiatives and emerging challenges in the field.
3. Explain public policy and its operations with special focus on policy relating to Government finance.
4. Make policies and know about the happenings in the world, in the nation and those in their locality.
5. Analyze and evaluate the impact of the public policy on firms and economy at large and work under various fields as policymakers.

Syllabus for Final Year of B.Tech. (Common for All Programs)
Semester VII (Autonomous)
(Academic Year 2022-2023)

Detailed Syllabus (Unit wise)		
Unit	**Description**	**Duration in Hours**
1	**Introduction and Overview of Public Systems:** Ideology of Public Systems; Mechanistic and Organic view of Society and Individuals, The Legal Framework; Federal Government; State and Local Governments, Government growth; The size of Government.	10
2	**Public Sector in the Economics Accounts:** Public Sector in the circular flow; Public Sector in the National Income Accounts.	6
3	**Public Choice and Fiscal Politics:** Direct Democracy; Representative Democracy; The Allocation Function; The Distribution Function; The Stabilization Function; Coordination of Budget Functions; The Leviathan Hypothesis.	8
4	**Introduction and Overview of Public Policy:** Markets and Government; Social goods and Market failure, Public expenditure and its evaluation; Cost Benefit Analysis, Public policy and Externalities, Taxation Policy and its impact, Income distribution, redistribution and social security issues Fiscal & Budgetary Policy, Fiscal Federalism in India.	12
5	**Case Studies in Expenditure Policy: Public Services** A) National Defense B) Highways C) Outdoor Recreation D) Education	6

Books Recommended:

Reference Books:

1. Introduction to Public Policy by Charles Wheelan, W.W. Norton & Company.
2. Understanding Public Policy by Thomas R. Dye, Prentice Hall.
3. Public Policy-Making: An Introduction by Anderson J.E., Boston, Houghton.
4. Public Administration by Avasthi & Maheshwari, Lakshminarayan Agarwal, Agra.
5. New Horizons of Public Administration by Bhattacharya, Mohit, Jawahar Publishers, New Delhi.
6. Public Administration and Public Affairs by Henry, Nicholas, Prentice Hall of India, New Delhi.
7. Public Finance 10th Edition by Harvey S Rosen and Ted Gayer, McGraw-Hill Education, 2013.
8. Public Finance in Theory and Practice by Musgrave and Musgrave.

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper based on the entire syllabus will comprise of 5 questions (All compulsory, but with internal choice as appropriate), each carrying15 marks, total summing up to 75 marks.
2. Total duration allotted for writing the paper is 3 hrs.

Syllabus for Final Year of B.Tech. (Common for All Programs)
Semester VII (Autonomous)
(Academic Year 2022-2023)

Continuous Assessment (B):

Theory:

1. Two term tests of 25 marks each 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. Average of the marks scored in the two tests will be considered for final grading.

Program: Artificial Intelligence & Machine Learning	B. Tech	Semester: VII
Course: Project Stage - I (DJ19CEP703)		

Course Objectives:

The Project work enables students to develop further skills and knowledge gained during the program by applyingthem to the analysis of a specific problem or issue, via a substantial piece of work carried out over an extended period. For students to demonstrate proficiency in the design of a research project, application of appropriate research methods, collection and analysis of data and presentation of results.

Guidelines:

1. Project Topic:

- To proceed with the project work it is very important to select a right topic. Project can be undertaken onany subject addressing the programme. Research and development projects on problems of practical andtheoretical interest should be encouraged.
- Project work must be carried out by the group of at least two students and maximum three and must be original.
- Students can certainly take ideas from anywhere, but be sure that they should evolve them in the uniqueway to suit their project requirements.
- The project work can be undertaken in a research institute or organization/company/any business establishment.
- Student must consult internal guide along with external guide (if any) in selection of topic.
- Head of department and senior staff in the department will take decision regarding selection of projects.

Student has to submit weekly progress report to the internal guide and whereas internal guide has to keep track on the progress of the project and also has to maintain attendance report. This progress report can beused for awarding term work marks.

- In case of industry projects, visit by internal guide will be preferred.

2. Project Report Format:

At the end of semester, a project report should preferably contain at least following details: -

- Abstract
- Introduction
- Literature Survey
  - Survey Existing system
  - Limitation Existing system or research gap
  - Problem Statement and Objective
  - Scope
- Proposed System
  - Analysis/Framework/ Algorithm
  - Details of Hardware & Software
  - Design details

- ➢ Methodology (your approach to solve the problem)
- Implementation Plan for next semester
- Conclusion
- References

Evaluation Scheme:

Semester End Examination (A):

Laboratory:

- Oral examination of Project Stage-I should be conducted by Internal and External examiners.
- Students have to give presentation and demonstration on the Project

Continuous Assessment (B):

Laboratory: (Term work)

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

1. Weekly Attendance on Project Day
2. Project work contribute
3. Mid-Sem Review
4. Project Report
5. Term End Presentation

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

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