Shri Vile Parle Kelavani Mandal's

Dwarkadas J. Sanghvi College of Engineering

(Autonomous College Affiliated to the University of Mumbai)

Scheme and detailed syllabus

Second Year B.Tech

in

Artificial Intelligence and Machine Learning

(Semester III)

Academic Year 2025-26

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 Second Year Undergraduate Program in Artificial Intelligence and Machine Learning: Semester III (Autonomous)
Academic Year(2025-26)

	Sr. No.	Course Code	Course	Teaching Scheme			Continuous Assessment (A)						Semester End Examination (B)						Aggregate (A+B)	Credits
				Theory (hrs.)	Practical (hrs.)	Tutorial (hrs.)	Term Test 1(TT1) -a	Term Test 2(TT2) -b	Assg/CP/GD/ Presentation/ Quiz) - c	Total (a+b+c)	Term work	CA Total	Duration	Theory	Oral	Pract	Oral & Pract	SEE Total		
PCC	1	DJS23APC201	Linear Algebra and Optimization Techniques	2	--	--	15	15	10	40	--	40	2	60	--	--	--	60	100	2
		DJS23APC201T	Linear Algebra and Optimization Techniques Tutorial	--	--	1	--	--	--	--	25	25	--	--	--	--	--	--	25	1
	2	DJS23APC202	Data Structures	3	--	--	15	15	10	40	--	40	2	60	--	--	--	60	100	3
		DJS23APC202L	Data Structures Laboratory	--	2	--	--	--	--	--	25	25	2	--	--	--	25	25	50	1
	3	DJS23APC203L	Python Laboratory	--	4	--	--	--	--	--	25	25	2	--	--	--	25	25	50	2
MD	4	DJS23AMD201	Operating Systems	2	--	--	15	15	10	40	--	40	2	60	--	--	--	60	100	2
OE	5	DJS23XOE211	Product Lifecycle Management	3	-	--	15	15	10	40	--	40	2	60	--	--	--	60	100	3
		DJS23XOE212	Management Information System	3	--	--	15	15	10	40	--	40	2	60	--	--	--	60	100	3
		DJS23XOE213	Operations Research	3	--	--	15	15	10	40	--	40	2	60	--	--	--	60	100	3
		DJS23XOE214	Personal Finance Management	3	--	--	15	15	10	40	--	40	2	60	--	--	--	60	100	3
		DJS23XOE215	Public System & Policies	3	--	--	15	15	10	40	--	40	2	60	--	--	--	60	100	3
		DJS23XOE216	Fundamentals of Biomedical Instruments	3	--	--	15	15	10	40	--	40	2	60	--	--	--	60	100	3
		DJS23XOE217	IPR & Patenting	3	--	--	15	15	10	40	--	40	2	60	--	--	--	60	100	3
		DJS23XOE218	Entrepreneurship and Startup Ecosystem	3	--	--	15	15	10	40	--	40	2	60	--	--	--	60	100	3
HS	6	DJS23XHS233T	Professional and Business Communication Tutorial	--	--	2	--	--	--	--	50	50	--	--	--	--	--	--	50	2
	7	DJS23XHS234	Economics and Financial Management	2	--	--	15	15	10	40	--	40	2	60	--	--	--	60	100	2
EL	8	DJS23XEL201L	Community Engagement Service	--	2	--				--	25	25	--	--	--	--	--	--	25	1
SC	9	DJS23XSC201P	Innovative Product Development I	--	2	--	--	--	--	--	25	25	--	--	--	--	--	--	25	1
			Total	**12**	**10**	**3**	**75**	**75**	**50**	**200**	**175**	**375**	**14**	**300**	**0**	**0**	**50**	**350**	**725**	**20**

Prepared by: Name and Signatures (with date)	Head of Department	Vice-Principal	Principal
	Dr. Aruna Gawde	Dr. Narendra Shekokar	Dr. Hari Vasudevan
Checked By Name and Signatures (with date)			

Continuous Assessment (A):

Course	Assessment Tools	Marks	Time (mins)
Theory	a. Term Test 1 (based on 40 % syllabus)	15	45
	b. Term Test 2 (on next 40 % syllabus)	15	45
	c. Assignment / course project / group discussion /presentation / quiz/ any other.	10	--
	Total marks (a + b + c)	40	
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.	50	

Continuous Assessment (B):

Course	Assessment Tools	Marks	Time (hrs.)
Theory / * Computer based	Written paper based on the entire syllabus.	60	2
	* 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 HoD Vice Principal Principal

Program: Artificial Intelligence & Machine Learning	S.Y.B. Tech.	Semester: III
Course: Linear Algebra and Optimization Techniques (DJS23APC201)		
Course: Linear Algebra and Optimization Techniques Tutorial (DJS23APC201T)		

Pre-requisite: -- Knowledge of

1. Solving a simultaneous linear equation using concept of matrices.
2. Calculus.

Course Objectives:

1. Understanding basic concepts of linear algebra.
2. Apply the concepts of vector spaces, linear transformations, matrices and inner product spaces in engineering.
3. To understand the concept of Optimization and enhance the problem solving skills and Optimization techniques.

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

1. Apply the concept of vector spaces, subspaces and the inner product spaces to the engineering problems.
2. Apply the concept of vector spaces using linear transformations which is used in computer graphics and inner product spaces.
3. Apply the concepts of eigenvalue and eigenvectors and diagonalization in linear systems.
4. Apply the concept of unconstrained optimization techniques to the engineering problems.

Detailed Syllabus: Linear Algebra and Optimization Techniques (DJS23APC201)		
Unit	**Description**	**Duration**
1	**Vector Space and Inner Product Spaces:** **Preview:** Linear combinations of vectors, Linearly dependent and independent vectors. Definition of vector space over $\mathbb{R}$, Subspaces. Basis and Dimension. Dot product in $\mathbb{R}$, Definition of general inner product on a vector space over $\mathbb{R}$. Norm of a vector in an inner product space. Cauchy-Schwarz inequality. Orthogonal sets and orthonormal sets in an inner product space. Orthogonal and orthonormal bases. Gram-Schmidt orthogonalization process simple examples in $\mathbb{R}^2$, $\mathbb{R}^3$.	**07**
2	**Linear Transformations:** Definition and properties. Kernel and image of a linear transformation, Rank-Nullity Theorem. Invertible Linear Transformation, Relation between matrices and Linear Transformations, Change of bases.	**06**
3	**Matrices:** Eigen values, Eigen vectors and their properties. Cayley-Hamilton theorem (without proof) and its application. Similar matrices, diagonalization of matrix. Functions of square matrix. Singular value decomposition.	**07**

4	**Calculus:** Gradient, directional derivatives, Jacobian, Hessian, convex sets, convex functions, and its properties. Unconstrained optimization techniques: Newton's method, Quasi Newton method.	**06**
	Total	**26**

Linear Algebra and Optimization Techniques Tutorial (DJS23APC201T)	
Tut.	**Suggested Tutorials**
1	Vector Space.
2	Inner https://www.elsevier.com/solutions/scopus/how-scopus-works/contentProduct Space.
3	Gram-Schmidt orthogonalization process.
4	Linear Transformation.
5	Eigen Value and Eigen Vector and Similarity of Matrices.
6	Similarity of Matrices and Diagonalization of Matrices.
7	Cayley-Hamilton Theorem, Functions of square matrix.
8	Singular value decomposition.
9	Calculus
10	Unconstrained Optimization Techniques.

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

Books Recommended:

Text books:

1. Linear Algebra, Jin Ho Kwak and Sungpyo Hong, Second edition Springer (2004).
2. Introductory Linear Algebra- An applied first course, Bernard Kolman and David, R. Hill, 9th Edition Pearson Education, 2011.
3. Operation Research by Hira & Gupta,S Chand.
4. Advanced Engineering Mathematics, Erwin Kreyszig, 10th Edition, John Wiley India, 2015.

Reference Books:

1. Elementary Linear Algebra, Stephen Andrilli and David Hecker, 5th Edition, Academic Press (2016).
2. Applied Abstract Algebra, Rudolf Lidl, Guter Pilz, 2 nd Edition, Springer 2004.
3. Contemporary linear algebra, Howard Anton, Robert C Busby, Wiley 2003.
4. Introduction to Linear Algebra, Gilbert Strang, 5 th Edition, Cengage Learning (2015).
5. Operations Research by S.D. Sharma Kedar Nath, Ram Nath & Co. Meerat.2015
6. Engineering optimization (Theory and Practice) by Singiresu S.Rao, New Age International publication, 2015.
7. Higher Engineering Mathematics, B. S. Grewal, 43rd Edition, Khanna Publishers, India, 2015.

Program: Artificial Intelligence & Machine Learning	S.Y.B. Tech.	Semester: III
Course: Data Structures (DJS23APC202)		
Course: Data Structures Laboratory (DJS23APC202L)		

Pre-requisite:
Knowledge of C Programming

Course Objectives:
The objective of the course is to introduce and familiarize students with linear and non-linear data structures, their use in fundamental algorithms and design & implementation of these data structures. To introduce students to the basics of algorithms and time complexity. To familiarize students with various sorting and searching techniques, and their performance comparison.

Course Outcomes: On successful completion of this course, student should be able to:
1. Understand the concept of time and space complexity for algorithms.
2. Assimilate the concept of various linear and non-linear data structures.
3. Solve the problem using appropriate data structure.
4. Implement appropriate searching and sorting technique for a given problem.

Detailed Syllabus: Data Structures (DJS23APC202)		
Unit	**Description**	**Duration**
1	**Basics of Algorithms:** Algorithms, Characteristics of an Algorithm, Time and Space Complexities, Order of Growth functions, Preliminary Asymptotic Notations. **Data Structures:** Introduction, Need of Data Structures, Types of Data Structures, Abstract Data Types (ADT)	04
2	**Linear Data Structures – LIST**: List as an ADT, Array-based implementation, Linked List implementation, Singly linked lists, Circularly linked lists, Doubly-linked lists, All operations (Insertion, Deletion, Merge, Traversal, etc.) and their analysis, Applications of linked lists - (Polynomial Addition).	06
3	**Linear Data Structure – STACK:** Stack as an ADT, Operations, Array and Linked List representation of Stack, Applications – Reversing data, Conversion of Infix to prefix and postfix expression, Evaluation of postfix and prefix expressions, Balanced parenthesis, etc. **Linear Data Structure – QUEUE:** Queue as an ADT, Operations, Implementation of Linear Queue, Circular and Priority Queue usingarrays and Linked List, DEQueue **Applications** – Queue Simulation	07
4	**Non-Linear Data Structure – TREES**: Tree Terminologies, Tree as an ADT, Binary Tree - Operations, Tree Traversals, Binary Search Tree (BST) - Operations, Expression Trees **Height Balanced Tree:** Creation of AVL Tree **Heap-** Operations on heap **Applications** - Huffman coding	08

5	**Non-Linear Data Structure – GRAPHS:** Graph Terminologies, Types of Graphs, Representation of Graph using arrays and Linked List, Breadth-First Search (BFS), Depth–First Search (DFS) **Applications of Graphs** -Topological sorting.	**06**
6	**Searching-** Linear Search, Binary Search and Fibonacci search. **Sorting**: Bubble Sort, Selection Sort, Heap Sort, Insertion Sort, Radix Sort, Merge Sort, Quick Sort. Analysis of Searching and Sorting Techniques. **Hashing**: Hash Functions, Overflow handling, Collision & Collision Resolution Techniques, Linear hashing, Hashing with chaining, Separate Chaining, Open Addressing, Rehashing and Extendible hashing.	**08**
	Total	**39**

Books Recommended:

Text books:

1. R. F. Gilberg and B. A. Forouzan, "Data Structures – A Pseudocode Approach with C", 2nd Edition, Cengage Learning, 2005.
2. Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed, "Fundamentals of Data Structures in C", 2nd Edition, W. H. Freeman and Company, 2008

Reference Books:

1. Mark A. Weiss, "Data Structures and Algorithm Analysis in C", 4th Edition, Pearson, 2014.
2. Tenenbaum, Langsam and Augenstein, "Data Structures using C", 2nd Edition, Pearson, 2015.
3. Seymour Lipschutz, "Data Structures", Schaum's Outline Series, 1st Edition, Tata McGraw-Hill, 2014.
4. Reema Thareja, "Data Structures using C", 2nd Edition, Oxford University Press, 2014.
5. Kruse, Leung and Tondo, "Data Structures and Program Design in C", 2nd Edition, Pearson Education, 2013.
6. M. T. Goodritch, R. Tamassia and D. Mount, "Data Structures and Algorithms in C++", 2nd Edition, Wiley, 2011.

Suggested Experiments

Data Structures Laboratory (DJS23APC202L)	
Sr.No	**Title of Experiment**
1	Implementation of Linked List using menu driven approach.
2	Implementation of different operations on linked list –copy, concatenate, split, reverse, count no. of nodes etc.
3	Implementation of polynomials operations (addition, subtraction) using Linked List.
4	Implementation of stack using menu driven approach.
5	Implementation of Infix to Postfix conversion.
6	Implementation of prefix and postfix evaluation using menu driven approach.
7	Implementation of parenthesis checker using stack.
8	Implementation of Linear queue using menu driven approach.

9	Implementation of circular queue using menu driven approach.
10	Implementation of double ended queue using menu driven approach.
11	Implementation of Priority queue program using array and Linked list.
12	Implementation of Binary Tree using menu driven approach.
13	Implementation of Binary Tree Traversal.
14	Implementation of BST.
15	Implementation of various operations on tree like – copying tree, mirroring a tree, counting the number of nodes in the tree, counting only leaf nodes in the tree.
16	Implementation of Graph traversal using menu driven program (DFS & BSF).
17	Implementation of Selection sort, Radix sort using menu driven.
18	Implementation of Heap & Heap Sort using menu driven program.
19	Implementation of Advanced Bubble Sort and Insertion Sort using menu driven Program.
20	Implementation of searching methods (Index Sequential, Fibonacci search, Binary Search) using menu driven program.
21	Implementation of hashing functions with different collision resolution technique

Batch wise laboratory work of minimum eight experiments from the above suggested list or any otherexperiment based on syllabus will be included, which would help the learner to apply the concept learnt.

Prepared by Checked by HoD Vice Principal Principal

Program: Artificial Intelligence & Machine Learning	S.Y.B. Tech.	Semester: III
Course: Python Laboratory (DJS23APC203L)		

Pre-requisite:
Knowledge of C Programming

Course Objectives:

- To learn the basic and OOP concepts of Python.
- To study various advanced python concepts like inheritance, exception handling, modules etc.
- Learn to develop GUI based standalone and web application.

Course Outcomes: On successful completion of this course, student should be able to:

1. Understand basic and object-oriented concepts, data structure implementation in python.
2. Apply file, directory handling and text processing concepts in python.
3. Apply database connectivity, client-server communication using python.
4. Utilize libraries like NumPy, Matplotlib, and Pandas for data manipulation, analysis, and visualization

Detailed Syllabus: Python Laboratory (DJS23APC203L)		
Unit	**Description**	**Duration**
1	**Python basics** Data types in python, Operators in python, Input and Output, Control statement, Arrays in python, String and Character in python, Functions, List and Tuples, Dictionaries, limitations of Python	08
2	**Control Statements and Functions:** If statement, if-elif-else, Repetition using while loop, for loop, defining a Function, Checking & Setting Your Parameters, Default arguments, Variable length arguments, Defining and calling functions within a function, Layers of Functions, Lambda and Filter, Zip (), Map (), Reduce () function, recursion, Function Decorators.	08
3	**Introduction to OOP:** Creating a Class, Self-Variables, Constructors, Types of Methods, Constructors in Inheritance, Polymorphism, the super () Method, Method Resolution Order (MRO), Operator Overloading, Method Overloading & Overriding, Interfaces in Python. Exceptions Handling: Exceptions, Exception Handling, Types of Exceptions, Except Block, assert Statement, User Defined Exceptions	16
4	**Python Modules** Building Modules, Packages: Python Collections Module, Opening and Reading Files and Folders (Python OS Module, Python Datetime Module, Python Math and Random Modules, Text Processing, Regular expression in python	08
5	**Python for Data Science**: Numpy: Working with Numpy, Constructing Numpy arrays, Printing arrays, Arithmetic	12

	Operations on matrix's, numpy zeros() Matplotlib: Matplotlib-Plot different charts, Pandas: Data Processing, Pandas-Data structure, Pandas-Series data, Data Frames, Introduction to data pre-processing: Data Cleaning, Pandas plotting, Exploratory Data analysis. Data Visualization: Heat map techniques	
	Total	**52**

Books Recommended:

Text books:

1. Paul Berry, "Head First Python: A Brain-Friendly Guide", 3rd Edition, O'Reilly, 2023
2. Dr. R. Nageswara Rao, "Core Python Programming", 3rd Edition, Dreamtech Press, 2018.
3. Mark Lutz, "Learning Python", 5th Edition, Oreilly Publication, 2013.
4. E Balagurusamy, "Introduction to computing and problem-solving using Python", McGraw Hill Education, 2018.

Reference Books:

1. Bill Lubanovic, "Introducing Python (2nd Edition)" 2nd Edition, O'Reilly Media, December 2019.
2. Dan Bader, David Amos, Joanna Jablonski, Fletcher Heisler, "Python Basics: A Practical Introduction to Python (1st Edition)", 1st Edition, Real Python, March 2021.
3. Luciano Ramalho, "Fluent Python", 2nd Edition, O'Reilly Media, May 2022

Suggested Experiments:

Python Laboratory (DJS23ALPC303)	
Sr. No	**Title of Experiment**
1	Write python programs to understand Expressions, Variables, Quotes, Basic Math operations.
2	Write python programs to demonstrate applications of different decision-making statements.
3	Write a Python program to implement Basic String Operations & String Methods.
4	Write a Python program to implement functions of List, Tuples, and Dictionaries.
5	Write a Python program to implement Arrays (1D, 2D) applications.
6	Write a Python program to implement Functions and Recursion.
7	Write a Python program to implement Programs based on Lambda, Map, and Reduce Functions.
8	Write a Python program to implement program to implement concept of Function decorators.
9	Write python programs to implement Classes & objects, Constructors
10	Write python programs to implement Inheritance & Polymorphism.
11	Write python programs to implement Exception handling.
12	Write python programs to understand different File handling operations with exception handling.
13	Write python programs to implement database connectivity and DDL and DML commands in Python using SQLite.
14	Implement different Machine learning packages like numpy, pandas and matplotlib.

15	Implement Data cleaning techniques and Data plotting's using pandas

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	S.Y B.Tech	Sem: III
Course: Operating Systems (DJS23AMD201)		

Prerequisite:

1. Programming Language C.
2. Basics of Hardware, i.e., ALU, RAM, ROM, HDD etc.

Course Objectives: The objective of this course is to familiarize students with the functionality of an Operating System, its basic components & interaction among them.The course will also expose students to analyze and evaluate different policies for scheduling, deadlocks, memory management, synchronization, file management & I/Oand implement these policies using a suitable programming language.

Course Outcomes: On successful completion of this course, student should be able to:

1. Understand the architecture and functionality of computer systems and operating systems.
2. Understand and apply the fundamental concepts of process and thread management and evaluate scheduling algorithm's performance to optimize operating system efficiency.
3. Identify the need of concurrency and apply principles of concurrency to solve classical synchronization problems.
4. Understand and apply deadlock handling strategies.
5. Identify the need for memory management and apply the mechanisms for the same.

Detailed Syllabus: Operating Systems (DJS23ACMD301)		
Unit	**Description**	**Duration**
1	**Computer system overview:** Processor, Memory, Cache, I/O modules, System Bus, Multiprocessor and Multicore organization. Operating System Objectives, functions and services, Resource manager, Evolution of operating system, Introduction to key terms, Process, Memory management, Operating System structures (monolithic, microkernel), Types of Operating Systems: Batch, Multiprogramming. Multitasking, Time Sharing, Parallel, Distributed, Real-time, Linux, Mobile OS.	04
2	**Process Management:** Concept of a Process, Process States (5 state model and 7 state model), creation and termination, Process Description, Process Control Block. **Threads:** Concept of a Thread, Types of Threads Thread states, Concept of Multithreading, **Scheduling**: Types of Schedulers, Types of Scheduling mechanisms, Preemptive and Non-preemptive, Scheduling algorithms and their performance evaluation: FCFS, SJF, SRTF, Priority based, Round Robin.	06
3	**Process Synchronization Concurrency:** Principles of Concurrency, Process Interaction. MutualExclusion: Requirements, Hardware Support, Semaphores and Mutex, Monitors, Classical synchronization problems: Producer and Consumer problem, Readers/Writers Problem, Solutions usingSemaphore and Monitor.	06

4	**Deadlock:** Principles of deadlock, Reusable resources, Consumable Resources, Conditions for deadlock, Resource Allocation Graph, Deadlock Prevention, Deadlock Avoidance: Banker's Algorithm for Single & Multiple Resources, Deadlock Detection and Recovery. Dining Philosophers Problem. Solution using Semaphore and Monitor.	05
5	**Memory Management** Memory Management Requirements, Memory Partitioning: Fixed Partitioning, Dynamic Partitioning, Memory Allocation Strategies: Best-Fit, First Fit, WorstFit, Next Fit, Relocation, Paging, Segmentation. Virtual Memory: Structure of Page Tables, Demand Paging, Page Replacement Strategies: FIFO, Optimal, LRU, LFU, Thrashing.	05
	Total	26

Books Recommended:

Text Books

1. William Stallings, Operating System: Internals and Design Principles, Prentice Hall, 8th Edition, 2014, ISBN-10: 0133805913 • ISBN-13: 9780133805918.
2. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts, John Wiley & Sons, Inc., 9th Edition, 2016, ISBN 978-81-265-5427-0
3. Andrew Tannenbaum, Operating System Design and Implementation, Pearson, 3rd Edition.

Reference Books:

1. Maurice J. Bach, "Design of UNIX Operating System", PHI
2. Achyut Godbole and Atul Kahate, Operating Systems, Mc Graw Hill Education, 3rd Edition
3. The Linux Kernel Book, Remy Card, Eric Dumas, Frank Mevel, Wiley Publications.

Web Links

1. https://nptel.ac.in/courses/106102132
2. https://nptel.ac.in/courses/106106144
3. https://nptel.ac.in/courses/106108101

Program: B.Tech in Artificial Intelligence and Machine Learning	S.Y.B.Tech	Semester : III

Open Elective for all Programs

Course Code: Product Lifecycle Management	Course Code: DJS23XOE211

Teaching Scheme (Hours / week)				Evaluation Scheme							
				Continuous Assessment Marks (A)				Semester End Examination Marks (B)			Total marks (A+B)
Lectures	Practical	Tutorial	Total Credits	Term Test 1	Term Test 2	Assignment	Total	Theory			
				15	15	10	40	60			100
				Term Work				Laboratory Examination			
3	--	--	3	Laboratory Work	Tutorial / Mini project / presentation / Journal / Practical	Total Term work		Oral	Practical	Oral & Practical	--
				--	--	--		--	--	--	

Prerequisite:

1. Basic Management knowledge

Objectives: The objective of the course is

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.
5. To acquaint students with the need of Environmental aspects in PLM & its implementation.

Outcomes: On completion of the course, the 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. Acquire knowledge in applying virtual product development tools.
4. Acquire knowledge in implementation of Environmental aspects in PLM.

Detailed Syllabus:

Unit	Description	Duration
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.	07
2	**Product Design and Development:** 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.	07
3.	**Methodological Evolution of Product Design:** Concurrent Engineering, Characteristic Features of Concurrent Engineering, Concurrent Engineering, Life Cycle Approach, Characteristic Features of Life Cycle Approach. 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. New Product Development (NPD) and Strategies, Product Configuration and Variant Management. **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, Tools and techniques for integrated design, Implementation of international standards.	10
4	**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.	07

5	**Engineering Methods for product Duration design & evaluation:** Durability of Products and Components, Design for Fatigue, Infinite Life Approach, Design for Finite Life. **Product Recovery Planning & Analysis:** Approach to the Recovery Problem, Method for Recovery Cycles Planning, Calculation Models for Recovery Cycles Planning, Basic procedure, Determinant Factors for Recovery, Effective Component Reusability, Recovery Fractions, Extension of Useful Life.	**08**
	Total	**39**

Books Recommended:

Textbooks:

1. John Stark, ― Product Lifecycle Management: Paradigm for 21st Century Product Realisation‖, Springer-Verlag, 2004. ISBN: 1852338105
2. Fabio Giudice, Guido La Rosa, Antonino Risitano, ― Product Design for the environment-A life cycle approach‖, Taylor & Francis 2006, ISBN: 0849327229

Reference Books:

1. Saaksvuori Antti, Immonen Anselmie, ― Product Life Cycle Management‖, Springer, Dreamtech, ISBN: 3540257314
2. Michael Grieve, ― Product Lifecycle Management: Driving the next generation of lean thinking‖, Tata McGraw Hill, 2006, ISBN: 0070636265
3. François Villeneuve, Luc Mathieu, Max Giordano ―Product Life-Cycle Management: Geometric Variations. (2010). United Kingdom: Wiley.

Evaluation Scheme:

Continuous Assessment (A):

Will consist of following three components:

1) Term Test 1 (based on 40 % syllabus) – 15 marks.
2) Term Test 2 (on next 40 % syllabus) – 15 marks.
3) Assignment / course project / group discussion / presentation / quiz – 10 marks Total summing up to 40 marks.

Semester End Examination (B):

Theory:

Question paper based on the entire syllabus will comprise of 4 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 60 marks.

Program: B.Tech in Artificial Intelligence and Machine Learning	S.Y.B.Tech	Semester : III

Open Elective for all Programs

Course : Management Information System	Course Code: DJS23XOE212

Teaching Scheme (Hours / week)				Evaluation Scheme							
				Continuous Assessment Marks (A)				Semester End Examination Marks (B)			Total marks (A+B)
Lectures	Practical	Tutorial	Total Credits	Term Test 1	Term Test 2	Assignment	Total	Theory			
				15	15	10	40	60			100
				Term Work				Laboratory Examination			
3	--	--	3	Laboratory Work	Tutorial / Mini project / presentation / Journal/ Practical	Total Term work		Oral	Practical	Oral & Practical	--
				--	--	--		--	--	--	

Prerequisite:

Nil

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

1. Explain the fundamental concepts of the management information systems used in business.
2. Describe IT infrastructure and its components and its current trends.
3. Use the tools and technologies for accessing information from databases to improve business performance and decision making
4. Identify and explain the security and ethical challenges in MIS along with the measures to be taken
5. Select a suitable social computing platform for the given requirements

that integrates AI and IoT.

6. Explain the processes involved in the information system within the organization includes information acquisition and enterprise and global management technologies.

Detailed Syllabus:		
Unit	**Description**	**Duration**
1	**Foundation Concepts** • Definition and scope of Management Information Systems (MIS) in business, • Functional area information system, • The components of information systems, • Impact of IT on organizations and society, • Business Process – BPR and BPI. • Business Pressure, Organizational responses. Competitive Advantage and Strategic IS's.	**04**
2	**Information Technology Infrastructure** • Overview of IT infrastructure, • Hardware and software, • Computer systems: End user and enterprise, • Computing computer peripherals: Input, output, and storage technologies, Application software: End user applications,	**05**
	• 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,	
3	**MIS Tools and applications for Decision making** • ERP and ERP support of business • Business intelligence (BI): Managers and Decision Making. • Decision Support System (DSS): types, components, Data mining. • Executive information system. • Role of AI in decision making. • Role of predictive analytics and data visualization in business	**10**
4	**Security and Ethical Challenges** • Information security fundamentals • Key principles of information security • Common threats and vulnerabilities in MIS • Security measures and controls • Access control mechanisms: authentication, authorization, and accounting (AAA) • Encryption techniques and cryptographic protocols • Ethical, and societal challenges of IT • Legal and regulatory framework • Privacy Policies	**08**

5	**Social Computing (SC)** • Web 2.0 and 3.0: static and dynamic platform, integration with AI and IoT • SC in business-shopping: leveraging social media platforms, Social listening and sentiment analysis • Social computing in Customer Relationship Management (CRM) • Marketing, operational and analytic CRM • E-business and E-commerce – B2B B2C, E-commerce platforms and payment gateways • Mobile commerce: growth trends, mobile wallets, contactless payments, shopping apps and platforms	**06**
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 • Business processes and information systems	**06**
	Total	**39**

Books Recommended:

Textbooks:

1. A. K. Gupta, Management Information System, S. Chand Limited, 2010.
2. K. K. Ghosh, Saini Das, and S. Mukherjee, Management Information System, Management, IIT, Kharagpur, 2021.

Reference Books:

1. J. A. O'Brien, G. Marakas, Management Information Systems, McGraw-Hill Companies, Incorporated, 2006.
2. K. Rainer, B. Prince, Management Information Systems, Wiley, 2016.

Web References

- Management Information System (https://nptel.ac.in/courses/110105148)
- Management Information System (https://archive.nptel.ac.in/courses/110/105/110105148/)

<u>Evaluation Scheme:</u>

Continuous Assessment (A):

Will consist of following three components:

1) Term Test 1 (based on 40 % syllabus) – 15 marks
2) Term Test 2 (on next 40 % syllabus) – 15 marks
3) Assignment / course project / group discussion / presentation / quiz – 10 marks Total summing up to 40 marks

Semester End Examination (B):

Theory:

Question paper based on the entire syllabus will comprise of 4 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 60 marks.

Prepared by Checked by Head of the Department Vice Principal Principal

Program: B.Tech in Artificial Intelligence and Machine Learning	S.Y.B.Tech	Semester : III
Open Elective for all Programs		
Course : Operations Research	Course Code: DJS23XOE213	

Teaching Scheme (Hours / week)				Evaluation Scheme								
				Continuous Assessment Marks (A)				Semester End Examination Marks (B)			Total marks (A+B)
Lectures	Practical	Tutorial	Total Credits	Term Test 1	Term Test 2	Assignment	Total	Theory			
				15	15	10	40	60			100
				Term Work				Laboratory Examination			
3	--	--	3	Laboratory Work	Tutorial / Mini project / presentation/ Journal/ Practical	Total Term work		Oral	Practical	Oral & Practical	--
				--	--	--		--	--	--	

Prerequisite: Knowledge of

1. Mathematics.
2. Probability

Objectives: The objective of the course is

1. Formulate a real-world problem as a linear programming problem and able to solve.
2. Understand the optimization tools that are needed to solve linear programming problems.

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

1. Formulate the real-world optimization problem into a Linear Programming Problem (LPP) and analyses the solution obtained using LPP optimization models.
2. Solve Linear Programming Problems using transportation and assignment models.
3. Apply Decision Theory to determine the optimal course of action when a number of alternatives are available, and their consequences cannot be forecast with certainty and uncertainty.
4. Apply Game Theory for decision making under conflicting situations where there are one or more opponents (players).
5. To breaking down a large problem into smaller sub problems and solved recursively or iteratively using Dynamic Programming models.

Detailed syllabus:		
Unit	**Description**	**Duration**
1	**Introduction to Operations Research**: Introduction, Structure of the Mathematical Model, Limitations of Operations Research. **Linear Programming**: Introduction, Linear Programming Problem, Requirements of LPP, Mathematical Formulation of LPP, Graphical method, Simplex Method, Penalty Cost Method or Big M-method, Two Phase Method.	**12**
2	**Transportation Problem**: Formulation, solution, unbalanced Transportation problem. Finding basic feasible solutions – Northwest corner rule, least cost method and Vogel's approximation method. Optimality test: MODI method. **Assignment Problem**: Introduction, Mathematical Formulation of the Problem, Hungarian Method Algorithm, Processing of n Jobs Through Two Machines and m Machines, Graphical Method of Two Jobs m Machines Problem Routing Problem	**08**
3	**Decision Theory:** Steps in Decision Theory approach, Decision-making Environment, Decision making under condition of certainty, Decision making under condition of uncertainty, Decision making under condition of risk, Maximum likelihood criterion.	**06**
4	**Game Theory**: Competitive games, rectangular game, saddle point, minimax/maxi min method of optimal strategies, value of the game. Solution of games with saddle points, dominance principle. Rectangular games without saddle point – mixed strategy for 2 X 2 games.	**06**
5	**Dynamic programming**: Characteristics of dynamic programming. Dynamic programming approach for Priority Management employment smoothening, capital budgeting, Stagecoach/Shortest Path, cargo loading and Reliability problems.	**07**
	Total	**39**

Books Recommended:

Textbooks:

1. Operations Research - An Introduction: Taha, H. A., Pearson Education, 2022.
2. Operations Research, Gupta, P. K. and Hira, D. S., S. Chand Publications, 2014.

Reference Books:

1. Operations Research: Introduction to Models and Methods, Boucherie, R. J., Tijms, H. and Braaksma, A., 2021.
2. Introduction to Operations Research: Hiller, F. S. and Liebermann, G. J., McGraw- Hill Higher Education, 2010.
3. Operations Research: Principles and Practice: Ravindran, A., Phillips, D. T. and Solberg, J. J., Wiley India Pvt. Limited, 2009.

Evaluation Scheme:

Continuous Assessment (A):

Will consist of following three components:

1) Term Test 1 (based on 40 % syllabus) – 15 marks
2) Term Test 2 (on next 40 % syllabus) – 15 marks
3) Assignment / course project / group discussion / presentation / quiz – 10 marks Total summing up to 40 marks.

Semester End Examination (B):

Theory:

Question paper based on the entire syllabus will comprise of 4 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 60 marks.

Program: B.Tech in Artificial Intelligence and Machine Learning	S.Y.B.Tech	Semester : III
Open Elective for all Programs		
Course : Personal Finance Management	Course Code: DJS23XOE214	

Teaching Scheme (Hours / week)				Evaluation Scheme								
				Continuous Assessment Marks (A)				Semester End Examination Marks (B)			Total marks (A+B)
Lectures	Practical	Tutorial	Total Credits	Term Test 1	Term Test 2	Assignment	Total	Theory			
				15	15	10	40	60			100
				Term Work				Laboratory Examination			--
3	--	--	3	Laboratory Work	Tutorial / Mini project / presentation/ Journal/ Practical		Total Termwork	Oral	Practical	Oral & Practical	
				--	--		--	--	--	--	

Prerequisite:

Nil

Objectives: The objective of the course is

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 familiarize the students with microfinance for accelerating the expansion of local microbusinesses.

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

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

Detailed Syllabus:

Unit	Description	Duration
1	**Overview of Indian Financial System**: Characteristics, Components and Functions of Financial System. Financial Instruments and Financial Markets, Financial Inclusion. **Introduction to Personal Finance** Personal Financial Planning in Action, Money Management Skills, Taxes in Your Financial Plan, Savings and Payment Services.Consumer Credit: Advantages, Disadvantages, Sources and Costs.	**07**
2	**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.	**07**
3	**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.	**09**
4	**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	**08**
5	**Introduction to Micro – finance** Micro-Finance: Definitions, Scope & Assumptions, Types of Microfinances, 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	**08**
	Total	**39**

Books Recommended:

Textbooks:

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:

Continuous Assessment (A):

Will consist of following three components:

1) Term Test 1 (based on 40 % syllabus) – 15 marks
2) Term Test 2 (on next 40 % syllabus) – 15 marks
3) Assignment / course project / group discussion / presentation / quiz – 10 marks

Total summing up to 40 marks.

Semester End Examination (B):

Theory:

Question paper based on the entire syllabus will comprise of 4 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 60 marks.

Program: B.Tech in Artificial Intelligence and Machine Learning											S.Y.B.Tech	Semester : III
Open Elective for all Programs												
Course : Public Systems and Policies											Course Code: DJS23XOE215	
Teaching Scheme (Hours / week)				Evaluation Scheme								
				Continuous Assessment Marks (A)						Semester End Examination Marks (B)		Total marks (A+ B)
Lectures	Practical	Tutorial	Total Credits	Term Test 1	Term Test 2	Assignment	Total			Theory		
				15	15	10	40			60		100
				Term Work						Laboratory Examination		
3	--	--	3	Laboratory Work		Tutorial / Mini project / presentation/ Journal/ Practical		Total Term work		Oral	Practical	Oral & Practical
				--		--		--		--	--	--

Prerequisite:

1. Basic Knowledge of Social science and Current affairs

Objectives: The objective of the course is

1. To explain public policy and its operations with special focus on policy relating to Government finance.
2. To analyze and evaluate the impact of public policy on firms and the economy at large.

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

1. Understand the importance of public systems in a fast-changing environment in the global context.
2. Analyse 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 public policy on firms and the economy at large and work under various fields as policymakers.

Detailed Syllabus:		
Unit	**Description**	**Duration**
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.	**06**
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.	**08**
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.	**10**
5	**Case Studies in Expenditure Policy: Public Services** A) National Defense B) Highways C) Outdoor Recreation D) Education	**05**
	Total	**39**

Books Recommended:

Reference Books:

1. Charles J, Wheelan, Introduction to Public Policy, W.W. Norton & Company, New York, 2011.
2. Thomas R, Dye, Understanding Public Policy, Prentice Hall, 2008.
3. Anderson, James E, "Public Policy-Making: An Introduction", Boston, 2011.
4. Avasthi & Maheshwari, Public Administration, Lakshmi Narain Agarwal, 2008.
5. Mohit Bhattacharya, New Horizons of Public Administration, Jawahar Publishers, New Delhi, 2011
6. Nicholas Henry, "Public Administration and Public Affairs, Prentice Hall of India, New Delhi, 2017.
7. Harvey S Rosen and Ted Gayer, Public Finance 10th Edition, McGraw-Hill Education, 2013.
8. Richard A Musgrave and Peggy B Musgrave, Public Finance in Theory and Practice, 5th Edition, Mcgraw Hill Book, 2017.

Evaluation Scheme:

Continuous Assessment (A):

Will consist of following three components:

1) Term Test 1 (based on 40 % syllabus) – 15 marks
2) Term Test 2 (on next 40 % syllabus) – 15 marks
3) Assignment / course project / group discussion / presentation / quiz – 10 marks

Total summing up to 40 marks.

Semester End Examination (B):

Theory:

Question paper based on the entire syllabus will comprise of 4 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 60 marks.

<table>
<tr><td colspan="8">Program: B.Tech in Artificial Intelligence and Machine Learning</td><td colspan="2">S.Y.B.Tech</td><td>Semester : III</td></tr>
<tr><td colspan="11">Open Elective for all Programs</td></tr>
<tr><td colspan="8">Course : Fundamentals of Biomedical Instruments</td><td colspan="3">Course Code: DJS23XOE216</td></tr>
<tr><td colspan="4" rowspan="2">Teaching Scheme (Hours / week)</td><td colspan="7">Evaluation Scheme</td></tr>
<tr><td colspan="4">Continuous Assessment Marks (A)</td><td colspan="2">Semester End Examination Marks (B)</td><td>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>Term Test 1</td><td>Term Test 2</td><td>Assignment</td><td>Total</td><td>Theory</td><td></td></tr>
<tr><td>15</td><td>15</td><td>10</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="4">Term Work</td><td colspan="2">Laboratory Examination</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>Laboratory Work</td><td>Tutorial / Mini project / presentation/ Journal/ Practical</td><td>Total Term work</td><td>Oral</td><td>Practical</td><td>Oral & Practical</td></tr>
<tr><td>--</td><td>--</td><td>--</td><td>--</td><td>--</td><td>--</td></tr>
</table>

Prerequisite:

1. Basic knowledge of Human Anatomy
2. Basic knowledge of Electronics

Objectives: The objective of the course is

1. To understand the basic principles and working of various medical instruments.
2. To familiarize the learners with the various medical imaging modalities, their operating principles, instrumentation and clinical applications.

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

1. Associate & describe the different physiological processes taking place within the human body.
2. Identify the use of biomaterials and apply principles of various transducers & sensors.
3. Demonstrate the working principle of various medical instruments.
4. Demonstrate principles used in imaging modalities and analysis.
5. Identifydifferent processes used in telemetry and telemedicine.

Detailed Syllabus:		
Unit	**Description**	**Duration**
1	**Basic Human Physiology** • **Cell:** Electrical activity of excitable cells (Structure and functions of cell. Polarization and depolarization of cell) • **Cardiovascular System**: Heart, Conductive tissues of heart, Cardiac cycle, Heart Valves, System and Pulmonary Circulation, Transmission of Cardiac Impulse, Blood Pressure, ECG (Einthoven's Triangle, Various leads and Waveforms). • **Muscle Physiology**: Muscle physiology and aspects of skin resistance. Generation of EMG • **Nervous System**: Different parts, their functions. Reflex actions and reflex arc, Function of Sympathetic and Parasympathetic nervous system. Generation of EEG	04
2	**Biomaterial, Transducers and Sensors:** • **Biomaterials used in fabrication of biodevices and implants**: Polymeric, Composite biomaterials, Metallic biomaterials, and Ceramic biomaterials. • Biopotential electrodes: Electrode tissue interface, Electrode electrolyte interface Electrodes used for ECG, EEG & EMG. • Transducers & sensors: temperature transducer, pulse sensor, glucose sensor, respiration sensor • Introduction of biomaterials, Classification of biomaterials	**10**
3	**Overview of Medical Instruments** • Classification, application and specifications of **diagnostic, therapeutic and clinical laboratory equipment** • Method of operation of these Bio Medical Instruments • ECG , EEG,EMG	**08**
4	**Imaging Modalities and Analysis:** • Radio graphic techniques, Computer Tomography, • MRI, PET, SPECT • Ultrasonography • Endoscopy • Thermography, Retinal Imaging • Imaging application in Biometric systems Analysis of digital images	**09**
5	**Telemetry & Telemedicine:** • Introduction to Biotelemetry • Physiological parameters compliant to biotelemetry • Components of Biotelemetry system Applications of telemetry in medical field (ECG, EEG & EMG)	**08**
	Total	**39**

Books Recommended:

Textbooks:

1. Leslie Cromwell, Biomedical Instrumentation and Measurement, Prentice hall of India, New Delhi,2007.
2. M.Arumugam, 'Bio-Medical Instrumentation', Anuradha Agencies, 2003.
3. Khandpur R.S, Handbook of Biomedical Instrumentation, Tata McGraw-Hill,

New Delhi, 2 Edition, 2003.
4. John G. Webster, Medical Instrumentation Application and Design, John Wiley and sons, NewYork, 1998.
5. Biomaterials Science - An Introduction to Materials in Medicine. B.D. Ratner, A.S. Hoffmann, F. J. Schoen, J. E. Lemons, Academic Press, 1997.

Reference Books:

1. Electronic Measurement and Instrumentation by Dr Rajendra Prasad
2. Ed. Joseph D. Bronzino, The Biomedical Engineering Hand Book, Third Edition, Boca Raton, CRC Press LLC, 2006.
3. Curry, T. S., Dowdey, J. E., & Murry, R. C. (1990). Christensen's physics of diagnostic radiology. Lippincott Williams & Wilkins.
4. Biomaterials: An Introduction, Joon Park, R. S. Lakes, Springer Science & Business Media

Evaluation Scheme:

Continuous Assessment (A):

Will consist of following three components:

1) Term Test 1 (based on 40 % syllabus) – 15 marks.
2) Term Test 2 (on next 40 % syllabus) – 15 marks.
3) Assignment / course project / group discussion / presentation / quiz – 10 marks

Total summing up to 40 marks.

Semester End Examination (B):

Theory:

Question paper based on the entire syllabus will comprise of 4 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 60 marks.

Program: B.Tech in Artificial Intelligence and Machine Learning				S.Y.B.Tech				Semester : III
Open Elective for all Programs								
Course : IPR and Patenting				Course Code: DJS23XOE217				
Teaching Scheme (Hours / week)				Evaluation Scheme				
				Continuous Assessment Marks (A)				Semester End Examination Marks (B)			Total marks (A+ B)
Lectures	Practical	Tutorial	Total Credits	Term Test 1	Term Test 2	Assignment	Total	Theory			
				15	15	10	40	60			100
				Laboratory Examination				Term work		Total Term work	--
3	--	--	3	Oral	Practical	Oral & Practical		Laboratory Work	Tutorial / Mini project / presentation/ Assignment		
				--	--	--		--	--	--	

Prerequisite:

NIL

Objectives: The objective of the course is

1. To promote the knowledge of intellectual property laws of India and international treaties.
2. To encourage innovation.

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

1. Map a given project/ idea to a suitable intellectual property rights.
2. Explain the fundamentals of the patents, copyrights, and design registrations.
3. Draft applications to protect various intellectual property rights.
4. Communicate with national and/or international intellectual property organisations.

Detailed Syllabus:		
Unit	**Description**	**Duration**
1	**Introduction to Intellectual Property Rights (IPR):** • Concept & meaning of IP and IPR. • General principles of intellectual property rights. • Need for intellectual property. • Categories of IPR instruments - Patents, Trademarks, Copyrights, Industrial. Designs, Plant variety protection, Trade secrets, Geographical Indications etc. • Ownership, assignment, licenses, infringement, validity period. • International treaties on IPR.	**03**
2	**Copyright and Design** 1. The Indian Copyright Act, 1957. 2. Meaning of copyrights and rights of copyrighted works. 3. Types of copyright. 4. Process of filing a copyright application. 5. Introduction to Designs Law – Definitions. 6. Registration of designs and procedure.	**09**
3	**Basics of Patents** • The Indian Patent Act and The Indian Patent Rules. • Conditions of patentability. • Patentable and non-patentable inventions. • Types of patent applications and patent specification. • Inventors and Applicants. • Category of applicants - natural person, small entity, startup and others. • Patent databases and patent search. • International Patent Classification code.	**09**
4	**Patent Application Drafting** • Patent application drafting: o Application. o Specification. o Claims drafting: ▪ Independent and dependent claims drafting. ▪ Process patent and product patent claims. o Abstract. o Drawings. o Declaration as to inventorship. o Statement and undertaking. • Drafting response to communications from patent office. o Reading and understanding examination reports. Drafting response.	**09**
5	**Procedure for Filing a Patent Application, Timelines and Fees** • Application for grant of patent. • Forms and Fees. • Request for (early) publication and / or (early) examination. • Patent examination and hearing.	**09**

	Pre-grant and post-grant opposition.	
	Total	**39**

Books Recommended:

Textbooks:

1. A Durafe and D Toradmalle, Intellectual Property Rights, Wiley, 2020.
2. H Rockman, Intellectual property law for engineers, scientists, and entrepreneurs, Wiley-IEEE Press, 2020.

Reference Books:

1. Bare Act, The Patents Act, 1970 with The Patents Rules, 2003, Universal, 2023.
2. Bare Act, The Copyright Act, 1957, Universal and LexisNexis, 2021.
3. Bare Act, The Designs ACT, 2000, Commercial Law Publishers (India) Pvt. Ltd. 2021

Online Resources:

1. W. Fisher, "Maps of Intellectual Property" https://cyber.harvard.edu/people/tfisher/IP/IPMaps.htm
2. World Intellectual Property Organisation courses https://www.wipo.int/academy/en/
3. Prof. Feroz Ali, "Patent Drafting for Beginners", https://onlinecourses.nptel.ac.in/noc24_hs59/preview

Evaluation Scheme:

Continuous Assessment (A):

Will consist of following three components:

1) Term Test 1 (based on 40 % syllabus) – 15 marks
2) Term Test 2 (on next 40 % syllabus) – 15 marks
3) Assignment / course project / group discussion / presentation / quiz – 10 marks

Total summing up to 40 marks.

Semester End Examination (B):

Theory:

Question paper based on the entire syllabus will comprise of 4 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 60 marks.

<table>
<tr><td colspan="5">Program: B.Tech in Artificial Intelligence and Machine Learning</td><td colspan="2">S.Y.B.Tech</td><td colspan="2">Semester : III</td></tr>
<tr><td colspan="9">Open Elective for all Programs</td></tr>
<tr><td colspan="7">Course : Entrepreneurship and Startup Ecosystem</td><td colspan="2">Course Code: DJS23XOE218</td></tr>
<tr><td colspan="4" rowspan="2">Teaching Scheme (Hours / week)</td><td colspan="5">Evaluation Scheme</td></tr>
<tr><td colspan="4">Continuous Assessment Marks (A)</td><td>Semester End Examination Marks (B)</td><td>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>Term Test 1</td><td>Term Test 2</td><td>Assignment</td><td>Total</td><td>Theory</td><td></td></tr>
<tr><td>15</td><td>15</td><td>10</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="4">Term Work</td><td colspan="2">Laboratory Examination</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>Laboratory Work</td><td>Tutorial / Mini project / presentation/ Journal/ Practical</td><td>Total Term work</td><td>Oral</td><td>Practical</td><td>Oral & Practical</td></tr>
<tr><td>--</td><td>--</td><td>--</td><td>--</td><td>--</td><td>--</td></tr>
</table>

Prerequisite:

Nil

Objectives: The objective of the course is

1. To foster an entrepreneurial mindset.
2. To guide participants in building effective Business Models.
3. To educate participants regarding Intellectual property and Fundraising for Innovative Ventures.

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

1. Effectively Navigate the Global Startup Landscape:
2. Cultivate an Entrepreneurial Mindset.
3. Create Effective Business Models.
4. Understand the significance of Intellectual Property rights.
5. Master Fundraising Strategies

Detailed Syllabus:		
Unit	**Description**	**Duration**
1	**Understanding the Entrepreneurial Ecosystem** • Introduction to Entrepreneurship and Startups • Role of Entrepreneurship in economy • Global and Local Entrepreneurial Landscapes • Role of Incubators and Accelerators • Case Studies of Successful Startups	**6**
2	**Developing a Startup Mindset** • Cultivating an Entrepreneurial Mindset • Market Analysis and Segmentation • Opportunity Recognition • Innovation and Idea Generation • Feasibility Analysis of Business Ideas • Role of innovation in Entrepreneurship • Fostering creativity • Practical Exercises and Workshops on Creative Problem Solving	**8**
3	**Business Model Development** • Introduction to Business Models • Lean Startup Methodology • Prototyping and Minimum Viable Product (MVP) • Financial Projections and Budgeting • Various forms of Business Ownership • Compliance and Legal Regulations • Operations and Supply Chain Management • Human Resource Management • Developing a marketing Strategy • Managing Growth Challenges	**10**
4	**Technological Innovation and Intellectual Property** • Technology and Entrepreneurship • Intellectual Property Basics (Patents, Trademarks, Copyrights) • Patent Search and Analysis • Strategies for Protecting Intellectual Property Ethical Considerations in Technology and Innovation	**8**
5	**Fundraising and Investment Strategies** • Fundraising Options for Startups • Angel Investors and Venture Capital • Crowdfunding Platforms • Financial Modelling for Startups Crafting an Effective Pitch	**7**
	Total	**39**

Books Recommended:

1. Alexander Osterwalder and Yves Pigneur, Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers, John Wiley & Sons, Jul2010.
2. Peter Thiel and Blake Masters, Zero to One: Notes on Startups, or How to Build the Future, Virgin Books, 2015.
3. Alejandro Cremades, The Art of Startup Fundraising: Pitching Investors, Negotiating the Deal, and Everything Else Entrepreneurs Need to Know" by, John Wiley & Sons, Inc., Hoboken, New Jersey, 2016.
4. Christensen, Clayton M. The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail. Boston, MA: Harvard Business School Press, 1997.
5. Brad Feld and Jason Mendelson, Venture Deals: Be Smarter Than Your Lawyer and Venture Capitalist, Wiley; 4th edition, 1 October 2019.

Evaluation Scheme:

Continuous Assessment (A):

Will consist of following three components:

1) Term Test 1 (based on 40 % syllabus) – 15 marks.
2) Term Test 2 (on next 40 % syllabus) – 15 marks.
3) Assignment / course project / group discussion / presentation / quiz – 10 marks

Total summing up to 40 marks.

Semester End Examination (B):

Theory:

Question paper based on the entire syllabus will comprise of 4 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 60 marks.

Program: Common to all Programs.	Group A / B	S.Y B. Tech.	Semester: III
Course: Professional and Business Communication Tutorial (DJS23XHS233T)			

Course:

Objectives:

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

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

1. Apply group discussion techniques in professional situations
2. Use employability skills to optimize career opportunities
3. Employ storytelling techniques for effective presentation
4. Prepare technical documents using appropriate style, format, and language
5. Analyze the concept of professional ethics
6. Demonstrate interpersonal skills in professional and personal situations

Professional and Business Communication (DJS23XHS233T)

The course is designed to equip students with essential skills, crucial for navigating the contemporary job market successfully and fostering a positive work environment through effective communication and collaboration. The assignments comprise of a combination of interactive activities, discussions, case studies and real-world simulations, to help students, not only to ace job interviews and professional interactions, but also to contribute positively to the ethical and productive functioning of any organization. For the project work, students must prepare and present a well-researched and persuasive business proposal, in groups, integrating the skills and knowledge acquired throughout the course.

Unit	Description of Tutorial Activities	No of Assign ments
1	**Group Discussion:** Purpose of a GD, types of GD, criteria for evaluating GD, Dos and Don'ts of GD **Activity:** *The students will be divided into groups of 8-12 and each group will be given a topic/case to discuss within a given time frame. Each student will submit a write-up on their observations of the GD.*	1
2	**Employment Skills** **Resume Writing:** Types of resumes, structure, content, and formatting of resume **Activity:** *The students will prepare and submit their individual resume according to the professional requirements.*	2

	Interview Skills: Types and modes of interview, Preparation for interview, Dos and Don'ts of interview, frequently asked questions during interview **Activity:** *The students will submit a write-up on the FAQs and participate in mock interviews*	
3	**Corporate Story Telling:** Elevator pitch, product stories, event stories, stories in presentations, storytelling in SOPs and interviews, storytelling to manage conflict or to motivate. **Activity:** *The students will be divided into groups of 8-12 and asked to give a team presentation using storytelling technique and submit the hardcopy of the ppt.*	1
4	**Technical Writing and Documentation** **Business Proposal Writing:** Types of business proposals, format of proposal, language and style, presentation of proposal **Meeting Documentation:** Planning layout of meetings, observing meeting decorum, drafting notice, agenda, and minutes of meeting **Activity:** *The students will be divided into groups of 8-12 and each group will conduct a mock meeting based on an agenda and submit a writeup of the meeting documentation.*	1
5	**Professional Ethics:** Effective work habits, accountability, integrity, and excellence **Activity:** *The students will be divided into groups of 8-12 and each group will analyse a case involving an ethical issue and submit the writeup.*	1
6	**Interpersonal Skills** **Team Building:** Difference between group and team, importance of teamwork, strategies to be a good team player **Activity:** *The students will be divided into groups of 8-12 and each group will be assigned a task to be accomplished as a team, for which they will submit the writeup.* **Leadership:** Types of leadership, leadership styles, case studies **Activity:** *Each student will submit a writeup involving a leader they admire, analysing various aspects of his leadership style.* **Time Management:** Importance of time management, cultural views of time, 80/20 rule, time wasters, setting priorities and goals **Activity:** *Each student will submit a writeup about a case involving time management.*	2

Batch wise tutorial work of minimum eight assignments from the above suggested list or any other assignments based on the syllabus will be included, which would help the learner to apply

the concepts learnt.

Books Recommended:

1. Fred Luthans, *"Organizational Behavior",* McGraw Hill, edition
2. Lesiker and Petit, *"Report Writing for Business",* McGraw Hill, edition
3. Huckin and Olsen, *"Technical Writing and Professional Communication",* McGraw Hill
4. Wallace and Masters, *"Personal Development for Life and Work",* Thomson Learning, 12th edition
5. Heta Murphy, *"Effective Business Communication",* Mc Graw Hill, edition
6. Sharma R.C. and Krishna Mohan, *"Business Correspondence and Report Writing",* Tata McGraw-Hill Education
7. Ghosh, B. N., *"Managing Soft Skills for Personality Development",* Tata McGraw Hill. Lehman,
8. Bell, Smith, "Management Communication" Wiley India Edition, 3rd edition.
9. Dr. Alex, K.," Soft Skills", S Chand and Company
10. Subramaniam, R., "Professional Ethics" Oxford University Press.
11. Sandeep Das, "How Business Story Telling Works: Increase Your Influence and Impact" Penguin Random House India Pvt. Ltd.

Evaluation Scheme:

Continuous Assessment (A):

Term Work: - 50 marks

Term Work shall comprise of:

Minimum 8 assignments: 25 marks

Business Proposal Presentation: 15 marks

Group Discussion: 10 marks

Program: Common to all Programs.	Group A / B	S.Y B. Tech.	Semester: III / IV
Course: Economics and Financial Management (DJS23XHS234)			

Pre-requisite: Knowledge of

1. Economics and Finance domain current affairs.

Objectives:

1. To describe the relationships among variables to analyse economic issues.
2. To Explain the function of the market and prices as an allocative mechanism.
3. To identify key macroeconomic indicators and measures of economic change, growth, and development
4. To understand basic concepts of financial management and their application in investment and financing decisions
5. To explore the relationship between Financial Management and Financial Statements.

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

1. Analyse individual decision making, how prices and quantities are determined in product and factor markets, microeconomic and macroeconomic outcomes
2. Analyse the performance and functioning of government, RBI, markets, and institutions in the context of social and economic problems.
3. Analyse the current economic status of India at global levels and provision in budget to address economic issues at national level.
4. Describe an understanding of the overall role and importance of the finance function.
5. Analyse financial performance and make appropriate inferences.

Economics and Financial Management (DJS23XHS234)		
Unit	**Syllabus Content**	**Hours**
1	**Introduction to Economics** Fundamentals of Economics, Definition and scope of economics, the nature of the economic problem, finite resources and unlimited wants, definitions of the factors of production and their rewards, definition of opportunity cost, the influence of opportunity cost on decision making. **Microeconomics and Macroeconomics** The role of markets in allocating resources, the market system, introduction to the price mechanism, Demand, Supply and Price determination, Price elasticity of demand and supply (PED).	06
2	**Role of Government and RBI** Money, Banking, Households, Firms, economies and diseconomies of scale, Market Structure, Fiscal Policy, Monetary Policy, Economic Growth, causes and consequences of recession, causes of economic growth, measurement of economic growth **i**nflation and deflation, living standards, indicators of living standards	04

3	**Government Policies** Last 20 years Journey of Indian Economy, Measures taken to grow Indian Economy, Meaning of India is the world's fifth-largest economy by nominal GDP and the third-largest by purchasing power parity (PPP), On a per capita income basis, India ranked 139th by GDP (nominal) and 127th by GDP (PPP) (Data reference year 2023), Comparison of top 5 largest economies in world, Discuss key points of India latest union budget and its impact on Indian economy and citizens, Meaning of Initiatives like Make in India, Digital India, Skill India etc. and expected impact on Indian Economy	04
4	**Overview of Financial Management** Fundamentals of financial management, principles and functions of the financial management, Strategy, methods, and techniques of the financial management, Overview of financial instruments, financial markets, financial Institutions	04
5	**Overview of Financial Statements** Balance Sheet, Profit and Loss Account, and Cash Flow Statement; Purpose of Financial Ratio Analysis; Liquidity Ratios; Efficiency or Activity Ratios; Profitability Ratios; Capital Structure Ratios; Stock Market Ratios;	08
	Total	26

Books Recommended:

Text books:

1. Datt & Sundharam's Indian Economy by Gaurav Datt & Biswajit Nag, S. Chand Publications, 73rd Edition,2024
2. Fundamentals of Financial Management by Prasanna Chandra, McGraw Hill Publications, 7th Edition, 2020

Reference Books:

1. Public Economics: The Macroeconomic Perspective by Burkhard Heer, Springer International Publications,2019
2. Indian Economy: Economic Ideas, Development, and Financial Reforms by Raj Kumar Sen, Deep & Deep Publications, 2008
3. Indian Economy: Performance and Policies by Dr. V. C. Sinha, SBPD publications, 2021
4. Financial Management by C. Paramasivan, T. Subramanian, New Age Publications,2009
5. Financial Management Practices in India by Sandeep Goel, Taylor & Francis Publications, 2016

Evaluation Scheme:

Continuous Assessment (A):

Will consist of following three components:

1) Term Test 1 (based on 40 % syllabus) – 15 marks.
2) Term Test 2 (on next 40 % syllabus) – 15 marks.
3) Assignment / course project / group discussion / presentation / quiz – 10 marks

Total summing up to 40 marks.

Semester End Examination (B):

Theory:

Question paper based on the entire syllabus will comprise of 4 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 60 marks.

Program: Common to all Programs.	Group A / B	S.Y B.Tech.	Semester: III
Course: Community Engagement Service (DJS23XEL201L)			

Pre-requisite:

1. Fundamentals of core branch
2. Communication Skills

Objectives:

1. To sensitise the student / learner into recognising community level problems & challenges and give them an opportunity to engage in activities for solving the same.

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

1. Applies knowledge understandings acquired from one's academic study/ field/ discipline for community level education, information dissemination by participation and engagement in community welfare activities.
2. Identify and experience commitment for community engagement activities that reinforce sense of belongingness and gratitude towards societal cause.
3. Witness diversity in communities and cultures and demonstrate change in approach / attitude as, an evidence of unconditional acceptance.
4. Recognise, experience and value, effectiveness of working in a team, demonstrating co-existence of the roles - sincere worker and effective leader.

Unit	Description
1	**Open Activities** • Participation in: blood donation camps organizer / donor, day-long tree plantation or afforestation / seed dispersal / cleanliness (water bodies, surrounding etc.) drives. • Literacy drives for children / youth / adults. One day hand holding activities in work-shop conduct for under privilege kids in the areas of – basic science, math, technical skill demonstration and building.
2	**Technical (Program core related)** • Cyber-crime, security awareness and vulnerabilities – sensitization, information dissemination and awareness sessions in indicated focus areas. Promotion and Sensitization for Sustainable living – focusing on solar power, water recycling, e-waste responsible disposal, waste recycling etc. in indicated focus areas. Focus areas: residential societies, schools, under-privileged areas, governments /private offices, and similar other establishments. **OR** **Field Survey**

	• Reporting on proactively conducted survey in the areas of resource management for – water, vegetables, electricity, crops etc.

Activities to be performed
Among the listed activities students are expected to complete one open activity mandatorily, and one technical (program core) OR field survey activity. The activities mentioned are exemplary in nature and any other additional activity of similar nature too can be undertaken by the learners, provided it is approved and endorsed by the faculty mentor / head of the department.

Suggested Activities

1. Undertaking cyber safety / security awareness sensitization drive / program especially for un-initiated students / individuals in schools / colleges / residential complex / offices etc. Typical suggested tabulation.

Participant No.	Name	Age	School/ College/ Residence/ Office	Email	Contact Number	Awareness Level	Remarks

2. Energy / Power assessment for establishments (societies, schools, colleges, residential complex, shops etc.) involving computing power devices ratings, power consumption over operating period, calculating energy cost from tariff card / rates for every group of appliances / devices or equipment. Typical suggested tabulation pattern.

Device/Appliance Group	Number of appliances / devices	Power Rating (kW)	Operating Hours (h/day)	Energy Consumption (kWh/day)	Tariff Rate (Rs. / kWh)	Energy Cost (Rs.)
Lighting Fixtures						
Ceiling Fans						
Air Conditioner (AC)						
Security Systems						
Water Pump						

3. Traffic light monitoring viz-e-viz average traffic density on road. Analysing the data and commenting on results. Evaluating and comparing impact on road repairs related lane

blockage and proportional recommendation for lights timing variations. Typical suggested tabulation pattern.

Sr. No.	Timestamp	Traffic Density	Traffic Light Status	Road Repair Status	Remarks

4. Help compute green footprint of select number of household (per member) - say 10 houses of 3+ members. This is for evaluating dependence upon non green energy sources and habits and changes in lifestyle for attempts at their reductions. Learners are encouraged to use typically available online carbon-footprint calculators. The table herewith maybe used for reference calculations.

House No.	House hold Name	Number of Members	Energy Usage (kWh)	Water Usage (liters)	Waste Production (kg)	Transportation Habits	Green Footprint

5. Compulsion of having a borewell for non-potable water supply in city residential complexes is a modern-day rule. Increased pace of re-development, as well as number of occupants in given area, has resulted in increased number of borewells being dug within and outside city limits.
Reduced yield, quality and quantity of water adds to the recurring maintenance cost of borewells, especially in the city areas. Poor water recharge systems along-with depleting open soil cover area in wake of wall-to-wall of concrete carpet aggravate the problem. Study, analyse and report a residential society's – capacity of water requirement, present day borewells in action, approximate yield, maintenance cost and frequency, borewell flushing iterations in wake of redevelopment in neighborhood. A typical tabulation mechanism for inferences can be as below:

Borewell No.	Location	Depth (ft)	Yield (Liters/Day)	Water Quality	Maintenance Cost (Rs.)	Remarks

6. Detection of Adulteration in food / fruits / vegetables / milk / mava /saffron etc. or contamination of potable drinking water.

Ex. Adulteration in fruits could be apple waxing, injecting chemicals in watermelon, pomegranate etc. to give it a bright red color, artificial ripening of mangos etc.

For a given activity, samples from more than one area, specifically from mofussil /interiors / 'gaothans' etc, may be obtained, to evaluate sample purity or extent of adulteration. Learners are encouraged to use online resources provided by 'Food Safety and Standards Authority of India' (*fssai*), for handholding in requisite procedures.

YouTube link:

Food Safety and Standards Authority of India: goo.gl/Y8Lzbu

Ex. 1 Milk Adulteration:

https://www.youtube.com/watch?v=pbnmeRUBxKk

Ex.2 Watermelon Adulteration:

https://www.youtube.com/watch?v=yrLAj7oJies

Product	Adulterant	Testing Method	Result	Remarks

Certificates and Formats:

Activity Endorsement Certificate

Date:

Community engagement service is a mandatory course, of two credits, introduced at second year of engineering under the autonomous structure of the institute.

Course objective: To sensitise the student / learner into recognising social problems & challenges and give them an opportunity to engage in activities for solving the same.

Course outcomes:

1. Knowledge application: Applies knowledge understandings acquired from one's academic study/ field/ discipline for community level education, information dissemination by participation and engagement in community welfare activities.
2. Commitment for cause: Identify and experience commitment for community engagement activities that reinforce sense of belongingness and gratitude towards societal cause.
3. Diversity: Witness diversity in communities and cultures and demonstrate change in approach / attitude as an evidence of unconditional acceptance.
4. Team: Recognise, experience and value effectiveness of working in a team, demonstrating co-existence of the roles - sincere worker and effective leader.

This is to certify that Mr./Ms. _____bearing SAP ID _____ is a student of S.Y. B.Tech., _____ branch of engineering. He / She is a bonafide student of SVKM's Dwarkadas J. Sanghvi College of Engineering, Mumbai. He / She is reliable, sincere, hardworking and capable of conducting _____ _____activity in your premises. We request you to kindly allow for the conduction of the activity and we also solicit your earnest co-operation in the same.

Signature

Name of Department Head:

Disclaimer

(This form must be read, signed, and submitted prior to the beginning of the community service activity.)

Student Details	**Activity Details**
Name	
SAPID	Date
Program	Time
Class/Div	Address

I, the undersigned _____accept the following terms and conditions unconditionally:

1. I accept and understand that the community activity identification and selection has been done willingly by me.
2. I undertake to convey that, I am apparently in good health and well-being, and suffer no physical impairment that would or should prevent my participation in the activity.
3. I undertake to bear all related expenses and risk of travel related to the activity and shall not hold any personnel from the institute responsible with regards to claims and / or loss in the process of conduct of activity.
4. I undertake that my parents or legal/local guardians are aware of said activity and agree to above mentioned terms and conditions.

Student's name & signature: _____

Parent or Guardian's name & signature: _____

Guidelines for Assessment of the work

• The review/progress monitoring committee shall be constituted by the Head of the Department. The progress of selected/assigned activities is to be evaluated on a continuous basis, holding at-least one review in the semester.

• In the continuous assessment, focus shall also be on each individual student's contribution to the team activity, their understanding and involvement as well as responses to the questions being raised at all points in time.

• Each group needs to submit following forms to respective supervisor after conducting both the activities,

- Activity Conduction Report
- Participant Feedback (online / offline)
- Participant Attendance (online / offline)
- Survey Report
- Participation certification

Forms for Technical Activity:

1. Activity Conduction Report

Sr. No.	**Name of the Activity**	
1	Date of Activity	
2	Activity type Open / Technical	
3	Activity objectives	
4	Place of Activity	
5	SAP id and Names of students	
6	Name of the Association	
7	Activity description	
8	No. of participants	
9	Photos (Geo tagged)	

2. Participant feedback (online / offline):

Sr. No.	Indicators	Scale: 1 (Lowest) to 5 (Highest)
1	The objectives of the training were clearly defined.	
2	The content was organized and easy to follow.	
3	This training experience will be useful to me.	
4	The trainer was knowledgeable about the training topics.	
5	The training objectives were met	

Evaluation Scheme:

Continuous Assessment (A):

Term Work: - 25 marks, distribution as herewith:

1. Rubric for Open Ended Activity (10 marks)

- Participation certificate/proof

2. Rubric for Technical Activity (15 marks)

Sr. No.	Performance Indicators (Maximum marks per indicator are given in bracket)	Marks
1	Pre-requisite documents (permission letter, presentation material, permission letters, etc.) [05 marks]	
2	Participant Feedback [05 marks]	
3	Participant attendance [05 marks]	
	TOTAL	

OR

3. Rubric for Field Survey Activity:

Sr. No.	Performance Indicators (Maximum 03 marks per indicator)	Marks
1	Topic selection	
2	Survey preparation	
3	Field work	
4	Analysis	
5	Report writing	
	TOTAL	

Program: Artificial Intelligence & Machine Learning	S.Y.B. Tech.	Semester: III
Course: Innovative Product Development I (DJS23XSC201P)		

Course Objectives:

1. To familiarize the students with the process of identifying the need (considering a societal requirement) and feasibility study for a selected real-world problem.

2. To provide a platform to collaborate and work as a team.

Course Outcome:

Learner will be able to:

1. Identify the requirements for a software/hardware solution based on societal/research needs.

2. Justify the need of the solution with proficiency in written and oral communication.

3. Develop interpersonal skills, while working as a team.

Guidelines for the proposed product design and development:

- Students shall form a team of 3 to 4 students (max allowed: 5-6 in extraordinary cases, subject to the approval of the department review committee and the Head of the department).
- Students should carry out a survey or apply standard engineering principles and identify the need of the solution, which shall be converted into conceptualization of a product/ solution, in consultation with the faculty supervisor/head of department/internal committee of faculty members.
- Students in the team shall understand the effective need for product development/ problem solving and accordingly decide the scope of work in consultation with the faculty supervisor.
- Faculty supervisor may provide inputs to students during the entire span of the activity, spread over 4 semesters, wherein the main focus shall be on self-learning.
- A record in the form of an activity logbook is to be prepared by each team, wherein the team can record weekly progress of work. The guide/supervisor should verify the recorded notes/comments and approve the same on a weekly basis.
- The focus should be on self-learning, the capability to design and innovate new products as well as on developing the ability to address societal problems. Advancement of entrepreneurial capabilities and quality development of the students through the yearlong course should ensure that the design and development of a product of appropriate level and quality is carried out, spread over four semesters.

Guidelines for Assessment of the work:

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

Review/Progress monitoring committee may consider the following points during the assessment.

Review/Progress monitoring committee may consider the following points during the assessment.

- Rubrics should be prepared by the department to accomplish the objective and outcomes of this course.
- Some of the evaluation parameter are as follows:
  - Motivation of work
  - Feasibility study
  - Relevance of the problem in recent time.
  - Teamwork
  - Presentation and Report Writing.

- **Two review per semester should be conducted and average of both will be considered as term-work.**

a. Marks awarded by the review committee based on rubrics for Review -I : 25
b. Marks awarded by the review committee based on rubrics for Review -II : 25