



Shri Vile Parle Kelavani Mandal's

Dwarkadas J. Sanghvi College of Engineering

(Autonomous College Affiliated to the University of Mumbai)

Scheme and Detailed Syllabus (DJS23)

Second Year B.Tech

in

Artificial Intelligence (AI) and Data Science

(Semester III)

To be Prepared by: - Board of Studies in Artificial Intelligence (AI) and Data Science

To be Recommended by: - Academic Council of Dwarkadas J. Sanghvi College of Engineering

To be Approved by: - Governing Body of Dwarkadas J. Sanghvi College of Engineering

With effect from the Academic Year: 2026-2027



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)



Scheme for Second Year Undergraduate Program in Artificial Intelligence (AI) and Data Science: SEM III (Autonomous)

Academic Year 2026-27

Sr. no.	Course Code	Course	Teaching Scheme				Semester End Examination (SEE) - A					Continuous Assessment (CA) - B					Aggregate (A+B)	Credits Earned		
			Theory (Hrs)	Practical (Hrs)	Tutorials (Hrs)	Credits	Duration (Hrs)	Theory	Oral	Pract	Oral & Pract	SEE Total (A)	Term Test 1 (TT1)	Term Test 2 (TT2)	Term Test 3 (TT3)	Term Test Total (TT1+TT2+TT3)				Term Work
1	DJS23SPC201	Linear Algebra and Optimization Techniques	2	--	--	2	2	60	--	--	--	60	15	15	10	40	--	40	100	2
	DJS23SPC201T	Linear Algebra and Optimization Techniques Tutorial	--	--	1	1	--	--	--	--	--	--	--	--	--	--	25	25	25	1
2	DJS23SPC202	Data Structures	3	--	--	3	2	60	--	--	--	60	15	15	10	40	--	40	100	3
	DJS23SPC202L	Data Structures Laboratory	--	2	--	1	2	--	--	--	25	25	--	--	--	25	25	50	1	
3	DJS23SPC203L	Python for Data Science Laboratory	--	4	--	2	2	--	--	--	25	25	--	--	--	25	25	50	2	
4	DJS23SMD201	Database Management Systems	2	--	--	2	2	60	--	--	--	60	15	15	10	40	--	40	100	2
	DJS23SMD201L	Database Management Systems Laboratory	--	2	--	1	2	--	--	--	25	25	--	--	--	25	25	50	1	
5	DJS23XOE211	Product Lifecycle Management																		
	DJS23XOE212	Management Information System																		
	DJS23XOE213	Operations Research																		
	DJS23XOE214	Personal Finance Management	3	--	--	3	2	60	--	--	--	60	15	15	10	40	--	40	100	3
	DJS23XOE215	Public Systems and Policies																		
	DJS23XOE216	Fundamentals of Biomedical Instruments																		
	DJS23XOE217	IPR and Patenting																		
6	DJS23XOE218	Entrepreneurship and Startup Ecosystem																		
	DJS23XHS233T	Professional and Business Communication Tutorial	--	--	2	2	--	--	--	--	--	--	--	--	--	--	50	50	50	2
7	DJS23XHS234	Economics and Financial Management	2	--	--	2	2	60	--	--	--	60	15	15	10	40	--	40	100	2
8	DJS23XEL201L	Community Engagement Service	--	2	--	1	--	--	--	--	--	--	--	--	--	--	25	25	25	1
9	DJS23XSC201P	Innovative Product Development I	--	2	--	1	--	--	--	--	--	--	--	--	--	--	25	25	25	1
10	DJS23SSC201	Software Development Environment Essentials	1	--	--	1	--	--	--	--	--	--	15	15	10	40	--	40	40	1
		Total	13	12	3	22	16	300	0	0	75	375	90	90	60	240	200	440	815	22

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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 and / or assignment.	25	
Laboratory & Tutorial	Performance in the laboratory and tutorial.	50	

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 /	Written paper based on the entire syllabus.	60	2
* Computer based	* 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

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Prerequisite:

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

1. Understand the concept of a basis in vector spaces and apply it to represent data points in terms of independent features or components.
2. Understand the role of linear transformations in machine learning algorithms, such as linear regression, logistic regression, and neural networks, for mapping inputs to outputs.
3. Apply eigenvectors in the context of secret-key cryptography to understand how transformations in key management can be represented by matrices.
4. Apply the concept of unconstrained optimization techniques to engineering problems.

Linear Algebra and Optimization Techniques (DJS23SPC201)

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 $\mathbb{R}^2$, $\mathbb{R}^3$, least squares approximation	08
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, Geometric interpretation of transformations (Rotation matrix, Reflection matrix, Scaling transformation) , Change of bases.	07
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, Principal Component Analysis .	07
4	Calculus: Gradient, directional derivatives, Jacobian, Hessian, convex sets, convex functions, and its properties, Gradient Descent Algorithm . Unconstrained optimization techniques: Newton's method, Quasi Newton method.	06
Total		28

List of Tutorials

1. Vector Space.
2. Inner Product 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, **Principal Component Analysis**
9. Calculus
10. Unconstrained Optimization Techniques.

Any other experiment based on syllabus may be included, which would help the learner to understand topic/concept.

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. *Applied Abstract Algebra*, Rudolf Lidl, Guter Pilz, 2nd Edition, Springer 2004.
2. *Contemporary linear algebra*, Howard Anton, Robert C Busby, Wiley 2003
3. *Introduction to Linear Algebra*, Gilbert Strang, 5th Edition, Cengage Learning (2015).
4. *Operations Research (Theory Methods & Applications)* by S.D. Sharma, Kedar Nath, Ram Nath & Co. Meerat 2024.
5. *Engineering optimization (Theory and Practice)* by Singiresu S.Rao, New Age International publication 2013.
6. *Higher Engineering Mathematics*, B. S. Grewal, 43rd Edition, Khanna Publishers, India, 2015.
7. *Elementary Linear Algebra*, Stephen Andrilli and David Hecker, 5th Edition, Academic Press (2016)

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Prerequisite:

Knowledge of C Programming

Course Objectives:

1. Familiarize students with linear and non-linear data structures and their application in fundamental algorithms.
2. Introduce students to the design and implementation of various data structures.
3. Provide a foundation in algorithms and time complexity analysis.
4. Teach various sorting and searching techniques and enable comparison of their performance.

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

1. Explain the concept of time and space complexity for algorithms.
2. Apply 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.

Data Structures (DJS23SPC202)

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).	07
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 using arrays and Linked List, DEQueue Applications – Queue Simulation	08
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		42

List of Experiments

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

Any other experiment based on syllabus may be included, which would help the learner to understand topic/concept.

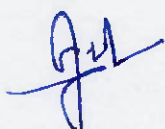
Books Recommended:

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:

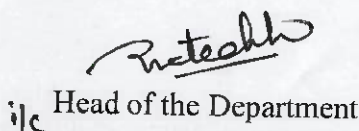
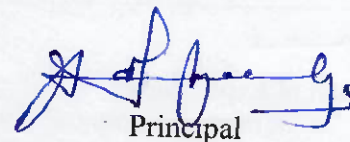
1. Mark A. Weiss, "Data Structures and Algorithm Analysis in C", 4th Edition, Pearson, 2014.
2. M. T. Goodrich, R. Tamassia and D. Mount, "Data Structures and Algorithms in C++", 2nd Edition, Wiley, 2011.
3. Kruse, Leung and Tondo, "Data Structures and Program Design in C", 2nd Edition, Pearson Education,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



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Prerequisite:

Knowledge of C Programming

Course Objectives:

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

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

1. Explain 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 and implement DDL and DML commands in Python
4. Use libraries like NumPy, Matplotlib, and Pandas for data manipulation, analysis, and visualization

Python for Data Science Laboratory (DJS23SPC203L)

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.	10
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	10
5	Python for Data Science: Numpy: Working with Numpy, Constructing Numpy arrays, Printing arrays, Arithmetic 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	12
Total		56

List of Experiments

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

Any other experiment based on syllabus may be included, which would help the learner to understand topic/concept. Minimum ten experiments from the above suggested list or any other experiment based on syllabus will be included, which would help the learner to apply the concept learnt.

Books Recommended:

Text books:

1. Dr. R. Nageswara Rao, "Core Python Programming", 3rd Edition, Dreamtech Press, 2018.
2. Mark Lutz, "Learning Python", 5th Edition, Oreilly Publication, 2013.
3. 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.

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Prerequisite:

Computer basics

Course Objectives:

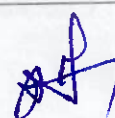
1. Understanding Database Fundamentals.
2. Develop Structured Query Language (SQL) for data definition, manipulation, and retrieval, including complex queries and transactions
3. Learn how to design efficient and normalized database schemas using Entity-Relationship (ER) modeling and normalization techniques.
4. Understand the principles of data integrity, validation, and security measures to protect sensitive information within a database.

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

1. Design an optimized database.
2. Construct SQL queries to perform operations on the database.
3. Demonstrate appropriate transaction management and recovery techniques for a given problem.
4. Apply indexing mechanisms for efficient retrieval of information from database.

Database Technologies Laboratory (DJS23SMD201)

Unit	Description	Duration
1.	Introduction to database management system Introduction, Characteristics of databases, File system v/s Database system, Data abstraction and data Independence, DBMS system architecture, Database Administrator The Entity-Relationship (ER) Model: Entity types: Weak and strong entity sets, Entity sets, Types of Attributes, Keys, Relationship constraints: Cardinality and Participation, Extended Entity-Relationship (EER) Model: Generalization, Specialization and Aggregation Relational Model: Introduction to the Relational Model, relational schema and concept of keys. Mapping the ER and EER Model to the Relational Model.	08
2.	Structured Query Language (SQL) & PLSQL Overview of SQL, Data Definition Commands, Integrity constraints: key constraints, Domain Constraints, Referential integrity, check constraints, Data Manipulation commands, Data Control commands, aggregate function-group by, having, Views in SQL, joins, Nested and complex queries, security & authorization : GRANT & REVOKE, Triggers, SQL functions, Procedure.	06
3.	Relational-Database Design Pitfalls in Relational-Database designs, Concept of normalization, Function Dependencies, First Normal Form, 2NF, 3NF, BCNF.	04
4.	Transaction management and recovery Transaction concept, Transaction states, ACID properties, Transaction Control Commands, Implementation of atomicity and durability Concurrent Executions, Serializability-Conflict and View, Concurrency Control: Lock-based, Timestamp-based protocols, Validation concurrency control, Deadlock handling, Recovery System: Failure classification, Log based recovery.	06



5.	Indexing Mechanism Hashing techniques, Types of Indexes: Single Level Ordered Indexes, Multilevel Indexes, Overview of B-Trees and B+ Trees	04
Total		28

List of Experiments:

1. To draw ER diagram for a problem statement
2. Map ER/ERR to relational schema
3. To implement DDL and DML commands with integrity constraints
4. To access and modify data using basic SQL
5. To implement aggregate functions
6. To implement Subqueries.
7. To implement joins & Views
8. Implement functions & procedures in SQL
9. To implement TCL commands of transaction in SQL
10. Examine consistency of database using concurrency control techniques (Locks)
11. To implement B-trees/B+ tree

Any other experiment based on syllabus may be included, which would help the learner to understand topic/concept. Minimum ten experiments from the above suggested list or any other experiment based on syllabus will be included, which would help the learner to apply the concept learnt.

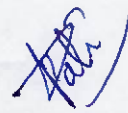
Books Recommended:

Text books:

1. Korth, Silberchatz, Sudarshan, *Database System Concepts*, 7th Edition, McGraw – Hill, 2019.
2. Elmasri and Navathe, *Fundamentals of Database Systems*, 7th Edition, Pearson education, 2016.
3. Peter Rob and Carlos Coronel, *Database Systems Design, Implementation and Management*, Thomson Learning, 5th Revised Edition, 2002.
4. G. K. Gupta *Database Management Systems*, 3rd Edition, McGraw – Hill, 2018
5. *The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling*, 3rd Edition Released July 2013, Publisher(s): Wiley
6. *Seven NoSQL Databases in a Week* By Sudarshan Kadambi , Xun (Brian) Wu.

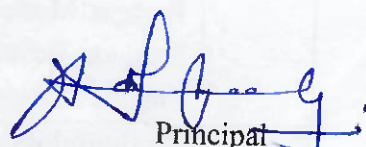
Reference Books:

1. Dr. P.S. Deshpande, *SQL and PL/SQL for Oracle 10g*, Black Book, Dreamtech Press, 2012
2. Sharaman Shah, —Oracle for Professional, Shroff Publishers & Distributers Private Limited, 1st edition, 2008
3. Raghuram Krishnan and Johannes Gehrke, *Database Management Systems*, 3rd Edition, McGraw –Hill, 2014.
4. Patrick Dalton, "Microsoft SQL Server Black Book", Coriolis Group, U.S., 11th edition (1 July 1997)
5. Lynn Beighley, "Head First SQL", (O'Reilly Media, 1st edition 28 August 2007)
6. *Architecting Data Lakes*, 2nd Edition, by Ben Sharma Released April 2018 Publisher(s): O'Reilly Media, Inc.
7. Lan Robinson, Jim Webber and Emil Eifrem *Graph databases*, O'Reilly Media, 2nd edition


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Program: Open Elective for all Programs	S.Y B.Tech.	Semester: III
Course: Product Life Cycle Management (DJS23XOE211)		

Pre-requisite:

1. Basic Management knowledge

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.
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.

Product Life Cycle Management (DJS23XOE211)		
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.	08
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.	08
3.	Methodological Evolution of Product Design: Concurrent Engineering, Characteristic Features of Concurrent Engineering, Concurrent Engineering, Life Cycle Approach, Characteristic Features of Life Cycle Approach.	10



	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.	
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.	08
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		42

Books Recommended:

Textbooks:

1. John Stark, — Product Lifecycle Management: Paradigm for 21st Century Product Realisationl, Springer-Verlag, 2004. ISBN: 1852338105
2. Fabio Giudice, Guido La Rosa, Antonino Risitano, — Product Design for the environment-A life cycle approachl, 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

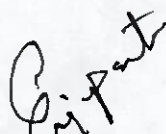
Total summing up to 40 marks.

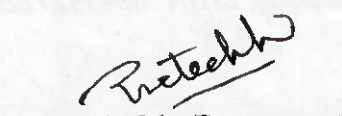
Semester End Examination (B):

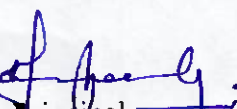
Theory:

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.


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Principal



Program: Open Elective for all Programs	S.Y B.Tech.	Semester: III
Course: Management Information System (DJS23XOE212)		

Pre-requisite:

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.

Management Information Systems (DJS23XOE212)		
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, • System software: Computer system management,	07



	• 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	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 • Business processes and information systems	06
	Total	42

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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/>)

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.

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Program: Open Elective for all Programs	S.Y B. Tech.	Semester: III
Course: Operations Research (DJS23XOE213)		

Pre-requisite: Knowledge of

1. Mathematics.
2. Probability

Objectives:

1. Formulate a real-world problem as a linear programming problem and able to solve.
2. Understand the optimisation 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 optimisation problem into a Linear Programming Problem (LPP) and analyse the solution obtained using LPP optimisation 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.

Operation Research (DJS23XOE213)		
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	10
3	Decision Theory:	07



	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.	
4	Game Theory: Competitive games, rectangular game, saddle point, minimax/maximin 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.	07
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.	06
	Total	42

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 Lieberman, 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.

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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.

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Program: Open Elective for all Programs	S.Y B.Tech.	Semester: III
Course: Personal Finance Management (DJS23XOE214)		

Pre-requisite:

1. Nil

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 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.

Personal Finance Management (DJS23XOE214)		
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.	08
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.	08
3	Income Tax Income Tax Act Basics- Introduction to Income Tax Act, 1961	09

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	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.	
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	09
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	42



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.

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Program: Open Elective for all Programs	S.Y B.Tech.	Semester: III
Course: Public Systems and Policies (DJS23XOE215)		

Pre-requisite:

Basic Knowledge of Social science and Current affairs

Objectives:

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.

Public Systems and Policies (DJS23XOE215)		
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.	07
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	07
	Total	42



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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.

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i/c

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Program: Open Elective for all Programs	S.Y B.Tech.	Semester: III
Course: Fundamentals of Biomedical Instruments (DJS23XOE216)		

Pre-requisite:

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

Objectives:

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. Identify different processes used in telemetry and telemedicine.

Fundamentals of Biomedical Instruments (DJS23XOE216)		
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	06
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	08



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	• Method of operation of these Bio Medical Instruments • ECG , EEG,EMG	
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	10
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		42

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, New York, 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

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Program: Open Elective for all Programs	S.Y B.Tech.	Semester: III
Course: IPR and Patenting (DJS23XOE217)		

Pre-requisite:

- NIL

Objectives:

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.

IPR and Patenting (DJS23XOE217)		
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.	06
2	Copyright and Design • The Indian Copyright Act, 1957. • Meaning of copyrights and rights of copyrighted works. • Types of copyright. • Process of filing a copyright application. • Introduction to Designs Law – Definitions. • 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

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4	Patent Application Drafting - Patent application drafting: - Application. - Specification. - Claims drafting: - Independent and dependent claims drafting. - Process patent and product patent claims. - Abstract. - Drawings. - Declaration as to inventorship. - Statement and undertaking. - Drafting response to communications from patent office. - 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. - Pre-grant and post-grant opposition.	09
Total		42

Books Recommended:

Textbooks:

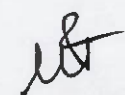
1. A Durafe and D Toradmalle, "Intellectual Property Rights", Wiley, 2020.
2. H Rockman, "Intellectual property law for engineers, scientists, and entrepreneurs", Wiley-IEEE Press, 2020.

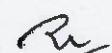
Reference Books:

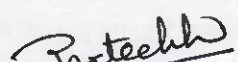
1. Bare Act, "The Patents Act, 1970 with The Patents Rules, 2003", Universal, 2023.
2. Bare Act, "The Copyright Act, 1957", Universal and LexisNexis, 2021.
3. Bare Act, "The Designs ACT, 2000", Commercial Law Publishers (India) Pvt. Ltd. 2021

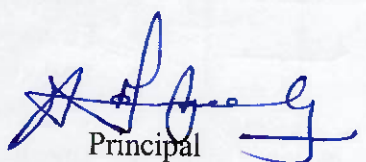
Web Resources:

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/


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Program: Open Elective for all Programs	S.Y B.Tech.	Semester: III
Course: Entrepreneurship and Startup Ecosystem (DJS23XOE218)		

Pre-requisite:

Nil

Objectives:

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

Entrepreneurship and Start-up Ecosystem (DJS23XOE218)		
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	8
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	10



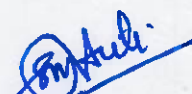
	• Developing a marketing Strategy • Managing Growth Challenges	
4	Technological Innovation and Intellectual Property • Technology and Entrepreneurship • Intellectual Property Basics (Patents, Trademarks, Copyrights) • Patent Search and Analysis • Strategies for Protecting Intellectual Property • Ethical 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	8
		42

Students shall complete five module-wise assignments or may opt for a relevant MOOC courses instead.

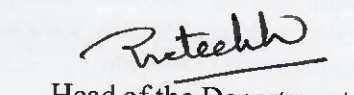
The faculty will decide whether Term Test 2 will be conducted or replaced with a presentation on a Start-up Idea.

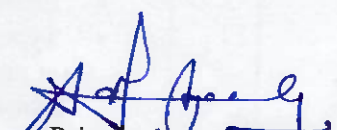
Books Recommended:

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.


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Program: All programs	Second Year B.Tech	Semester: III
Course: Professional and Business Communication Tutorial (DJS23XHS233T)		

Pre-requisite:

Foundational language proficiency and fundamentals of communication

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:

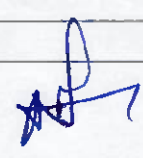
1. Apply group discussion techniques in professional situations
2. Use employability skills to optimize career opportunities
3. Employ storytelling techniques for effective presentation
4. Prepare technical documents using appropriate style, format, and language
5. Analyse the concept of professional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

Professional and Business Communication Tutorial (DJS23XHS233T)		
Unit	Description	Duration
1	Group Discussion • Purpose of a GD • Types of GD (topic based, case study based, etc.) • Criteria for evaluating GD • Dos and don'ts of GD	4
2	Employment Skills Resume Writing • Types of resumes • Structure • Content • Formatting of resume Interview Skills • Types and modes of interview • Preparation for interview • Dos and don'ts of interview • Frequently asked questions during interview	4
3	Communication for Professional Impact Corporate Storytelling • Elements of Storytelling • Types of Storytelling (Elevator pitch, product stories, event stories, stories in presentations, storytelling in SOPs and interviews, storytelling to manage conflict or to motivate) Virtual/Hybrid/Offline Presentation Techniques • Visual communication in presentations (Slide design principles)	4

	• Components of an effective presentation (Introduction, body, conclusion, Q & A session) • Audience engagement techniques (Opening strategies, interactive communication, body language etc.) • Group presentation skills (Collaborative preparation, transition between speakers, team coordination)	
4	Technical Writing and Documentation Business Proposal Writing • Types of business proposals • Format of business proposal • Language and style Meeting Documentation • Planning of meetings • Conduction of meetings and observing meeting decorum • Drafting notice, agenda, and minutes of meeting	4
5	Professional Ethics • Ethics, values and professionalism • Responsible business practices • Value-driven leadership and decision-making	2
6	Interpersonal Skills Team Building • Team dynamics • Collaborative synergy • Strategies for high performance teams Negotiation Skills • Negotiation types • Process • Strategic communication techniques Leadership • Leadership competencies • Styles of leadership • Emotional intelligence and self-leadership Time Management • Planning and optimization • Productivity Strategies • Time Management Matrix, agile time management, deep work, pomodoro technique, attention and energy management, time audit etc.	8
	Total	26

Professional and Business Communication Tutorial (DJS23XHS233T)

Sr. No.	Tutorial Title
1	Group Discussion
2	Resume Building
3	Mock Interview - Peer Evaluation
4	Recruitment Readiness



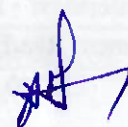
5	Corporate Storytelling
6	Presentation Skills
7	Mock Meeting - Role play
8	Professional ethics - Case studies
9	Team Building
10	Leadership Skills
11	Negotiation Skills
12	Time Management

Any other tutorial based on syllabus may be included, which would help the learner to understand topic/concept.

Books Recommended:

Reference Books:

- Sanjay Kumar and Pushp Lata, Communicate to Conquer: A Handbook of Group Discussions and Job Interviews, Prentice Hall India Learning Private Limited, New Delhi, 2009
- Wendy Enlow and Lousie Kursmark, Modernize your resume: Get noticed Get hired (Modernize your career), Emerald Career Publishing, North Carolina, 2016
- Sandeep Das, How Business Storytelling Works: Increase Your Influence and Impact, Penguin Random House India Pvt. Ltd., New Delhi, 2022
- Jacqueline Farrington, The Non-Obvious Guide to Better Presentations: How to Present Like a Pro (Virtually or in Person), Ideapress Publishing, Michigan, 2023
- Richard Johnson-Sheehan and Paul Thompson Hunter, Writing Proposals and Grants, Parlor Press, LLC, South Carolina, 2024
- Paul M. English, The Meeting Book: How the best companies meet better, John Wiley & Sons Inc, New Jersey, 2026
- Marianne M. Jennings, Business Ethics: Case Studies and Selected Readings, Cengage Learnings, Massachusetts, 2023
- Roy J. Lewicki and David M. Saunders, Negotiation, McGraw Hill, New York, 2025
- Ashley Herd, The Manager Method: A Practical Framework to lead, support and get results, Hay House Business, New York, 2026
- Oliver Burkeman, Four Thousand Weeks: Time Management for Mortals, Vintage, New York, 2022
- Kerry Patterson, Joseph Grenny, Ron McMillan, and Al Switzler, Crucial Conversations: Tools for Talking When Stakes Are High, McGraw Hill, New York, 2012.
- Robert Cialdini, Influence: The Psychology of Persuasion, Harper Business, New York, 2006
- Barbara Limmer and Laura Browne, Interview Speak: What Your Interviewer Really Wants to Hear, Career Press, New Jersey, 2025.
- Jessica Higgins, 10 Skills for Effective Business Communication, 2019.
- Sandeep Das, How Business Storytelling Works: Increase Your Influence and Impact, Penguin Random House India Pvt. Ltd., New Delhi, 2022.



Evaluation Scheme:

Tutorial: (Term work)

The Term work will consist of a minimum of ten to twelve tutorials, group discussion and mini project.

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

1. Tutorials (Performance of activities, Write-up): 25 marks
2. Group Discussion: 10 marks
3. Mini Project (Business Proposal and Presentation): 15 marks

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

Rahelika

Prepared by

SP

Checked by

Rateesh

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Head of the Department

Adarsh

Principal



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

Prerequisite: 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

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.

Module 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),	08
Module 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 inflation and deflation, living standards, indicators of living standards	04
Module 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	04



	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	
Module 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
Module 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
		28

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.

Prepared by

Checked by

Head of the Department

Principal



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

Prerequisite:

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. 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.

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.
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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.

[Handwritten signature]

**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=pbnmcRUBxKk>

Ex.2 Watermelon Adulteration:

<https://www.youtube.com/watch?v=yrLAj7oJics>

Product	Adulterant	Testing Method	Result	Remarks

Certificates and Formats:



Shri Vile Parle Kelvani Mandal's

DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING

(Autonomous College Affiliated to the University of Mumbai)

NAAAC Accredited with "A" Grade (CGPA : 3.18)



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,
 - o Activity Conduction Report
 - o Participant Feedback (online / offline)
 - o Participant Attendance (online / offline)
 - o Survey Report
 - o 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)	
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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:



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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	

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Head of the Department

Principal

Program: Artificial Intelligence (AI) and Data Science							Semester: III		
Course: Innovative Product Development I							Course Code: DJS23XSC201P		
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	
				--			--	--	--
				Laboratory Examination			Semester review		Average
--	2	--	1	Oral	Practical	Oral & Practical	Review 1	Review 2	
--	--	--	--	25	25	25			

- 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 design solution is to be validated with proper justification and the report is to be compiled in a standard format and submitted to the department.
- Efforts are to be made by the students to try and publish a technical paper, at a suitable publication (National /International), approved by the department research committee/ Head of the department.
- 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 year long course should ensure that the design and development of a product of appropriate level and quality is carried out, spread over two semesters, ie during the semesters III and IV.

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.

The tentative rubrics that can be followed can be as follows:

Review 1:

- Literature Review (Algorithms, Techniques, and Methodologies) / Product Review (Review of at least 5 technical papers).
- Presentation Quality
- Contribution as a team member and Punctuality

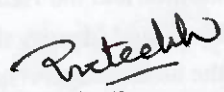
Review 2:

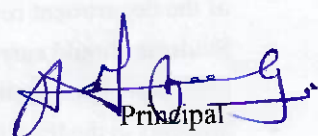
- Analysis of Literature Review
- Problem Statement and proposed solution
- System Process flow Diagram
- Presentation Quality
- Contribution as a team member and Punctuality
- Project Documentation


Prepared by


Checked by

i/c


Head of the Department


Principal

Program: B. Tech in Artificial Intelligence (AI) and Data Science

S.Y B. Tech

Semester: III

Course: Software Development Environment Essentials (DJS23SSC201)

Prerequisite: Basic knowledge of Computer Programming.

Course Objectives: The Objectives of the course are

1. To provide knowledge of Linux architecture, distributions, desktop environments, and operating system fundamentals.
2. To introduce version control concepts using Git and collaborative development using GitHub.
3. To develop proficiency in Linux text editors, shell environments, file systems, and partition management.
4. To understand Linux system components including boot process, GRUB, memory management, threading, networking, and system monitoring.
5. To provide hands-on experience with system tools, monitoring, kernel modules, and device management.
6. To enable students to perform system administration tasks including package and user management.

Course Outcomes: Students will be able to

1. Understand Linux architecture, distributions, and graphical interfaces.
2. Use Linux editors, shell commands, and manage file systems effectively.
3. Analyze system boot process, GRUB, memory management, and network interfaces.
4. Monitor and manage system resources using Linux tools and kernel utilities.
5. Perform system administration tasks including software installation and user management.

Software Development Environment Essentials (DJS23SSC201)

Unit	Description	Duration
1	Introduction to Git: What is Git, Installing Git, getting a Git Repository, Making Changes to a Git Repository, Oh No Fixing Mistake with Git, connecting to a Remote Repository, branching out with Git, Merging with Git, Remote and Branches, Simple GitHub Collaboration. Practical Components: Installing and configuring Git, creating and cloning repositories, tracking and committing changes, viewing repository history, resolving common mistakes using Git commands, connecting local repositories to remote repositories, creating and managing branches, performing merges, synchronizing repositories using push and pull operations, and collaborating on projects through GitHub. Assessments and Activities: Module challenge on setting up and managing a Git repository, quizzes on Git fundamentals, version control concepts, branching and merging strategies, hands-on lab exercises for repository management and collaboration workflows, and a practical assessment on using Git and GitHub for team-based software development.	05
2	Linux Orientation: Introduction to Linux for Developers, Kernel vs. Operating System and Tools, History of Linux, UNIX and Linux, Linux Distributions, Using Linux Distributions, Graphical Layers and Interfaces, Using KDE Desktop, Getting Help, Graphical Interfaces: GNOME and KDE Practical Components: Installing and configuring a Linux distribution in a virtual environment, navigating the Linux file system, exploring kernel and system information, using command-line and graphical interfaces, managing software packages, customizing KDE and GNOME desktop environments, and utilizing Linux help and documentation tools. Assessments and Activities: Module challenge on Linux installation and desktop customization, quizzes on Linux fundamentals, kernel and operating system concepts, Linux distributions, and graphical interfaces, hands-on lab exercises for system navigation and package management, and a practical assessment on configuring and using Linux desktop environments.	04

3	Starting to work in Linux: Introduction to Text Editors, vi Editor, emacs Editor, The Development of Shells, Introduction to Filesystems, Using fdisk, Partitioning Considerations Practical Components: Creating and editing files using vi and emacs editors, navigating and customizing shell environments, executing basic shell commands and scripts, exploring Linux filesystem hierarchy, viewing and managing disk partitions using fdisk, and understanding filesystem structures and partitioning schemes through hands-on exercises. Assessments and Activities: Module challenge on file editing and shell usage, quizzes on text editors, shell concepts, filesystems, and partitioning fundamentals, hands-on lab exercises involving vi/emacs operations, filesystem navigation, and disk partition management, and a practical assessment on creating, modifying, and managing files and partitions in a Linux environment.	05
4	System Components: System Boot, Using GRUB, System Initialization, Using Swap and OOM, Threading Models, Using Predictable Network Interface Device Names. Practical Components: Examining the Linux boot process, configuring and managing GRUB bootloader settings, analyzing system initialization and startup services, monitoring and managing swap space usage, observing system behavior under memory constraints and OOM conditions, exploring threading concepts and process management, and identifying and configuring network interfaces using predictable device naming convention Assessments and Activities: Module challenge on troubleshooting boot, memory, and network configuration issues, Working with system boot processes and GRUB configuration, exploring threading models and process execution.	04
5	Command Details: File Transfer Tools, Graphical Monitoring Tools, Using System Monitoring, Using Kernel Modules, Device Management, using udev, Using systemctl. Practical Components: Using file transfer tools for secure movement and synchronization of data between systems, working with graphical monitoring tools to analyze system performance, using system monitoring commands to track CPU, memory, disk, and process activity, managing kernel modules through loading and unloading, performing device management tasks using Linux subsystems. Assessments and Activities: module-based assessment on kernel module management and device handling, Hands-on lab on file transfer operations and system monitoring, practical exercises on using graphical monitoring tools to analyze system performance, tasks on inspecting system resources using command-line monitoring utilities.	02
6	System Administration and User Management: System Installation, Using Graphical Package Management, Using Yast, using rpm, using dpkg, using dnf, Basics of Users and Groups, Creating, Modifying, and Removing User Accounts. Practical Components: Installing and configuring a Linux system in a virtual environment, using graphical package management tools for software installation and updates, working with YaST for system configuration and administration tasks, managing software packages using rpm, dpkg, and dnf, and performing user and group administration including creating, modifying, and removing user accounts along with setting permissions and group memberships. Assessments and Activities: Hands-on lab on Linux system installation and initial configuration, practical exercises on using graphical package managers and YaST for software and system setup, command-based assessments on package management using rpm, dpkg, and dnf, user management tasks involving creation, modification, and deletion of user accounts, and quizzes on system installation, package management tools, and user and group administration concepts.	03
Total		23

Online Course:

Intro to Git | Coursera

<https://www.coursera.org/learn/linux-for-developers>

Useful Courses:

1. <https://www.coursera.org/learn/linux-for-developers#about>
2. <https://www.coursera.org/specializations/oss-development-linux-git>
3. <https://www.coursera.org/collections/linux-for-beginners>
4. <https://www.coursera.org/courses?query=linux>

Guidelines:

1. The identified courses are designed to develop students' technical, software engineering, and project management competencies, including the effective use of AI-enabled tools. Each selected course shall carry one credit
2. Faculty members shall act as mentors for the Coursera courses identified for various semesters of the program.
3. One faculty mentor shall be assigned to each class of the program for effective coordination and monitoring of this activity.
4. The assigned faculty mentor shall complete and review the course content before assigning the course to students.
5. The term work for these one-credit courses shall form a part of the Internal Continuous Assessment (ICA) component.
6. The Term work (ICA) component shall carry 40 marks

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

- 15 Marks: Evaluation based on the score obtained in the assigned Coursera course (Marks awarded in proportion to the final Coursera score, scaled to a maximum of 15 marks)
- 15 Marks: Faculty-curated evaluation conducted through the Coursera platform
- 10 Marks: Internal faculty evaluation through quizzes, assignments, presentations, or Project

Prepared by

Checked by

Ruteesh
i/c Head of the Department

Principal
Principal

Page 10 of 10
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[Signature]

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15th of the 19th century

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