Shirpur Education Society's

R. C. Patel Institute of Technology, Shirpur

(An Autonomous Institute)

Course Structure and Syllabus

Second Year B. Tech

Artificial Intelligence and Machine Learning

With effect from Year 2024-25

Shahada Road, Near Nimzari Naka, Shirpur, Maharashtra 425405
Ph: 02563 259 802, Web: www.rcpit.ac.in

Second Year B. Tech Artificial Intelligence and Machine Learning Semester-III (w.e.f. 2024-25)

Sr	Course Category	Course Code	Course Title	Teaching Scheme			Continuous Assessment (CA)				ESE	Total	Credit
				L	T	P	TA [A]	Term Test 1 (TT1)	Term Test 2 (TT2)	Average of (TT1 & TT2) [B]	[C]	[A+B+C]	
1	PC	RCP23ACPC301	Linear Algebra and Optimization Techniques	3			20	20	20	20	60	100	3
2	PC	RCP23ACPC302	Data Structures	3			20	20	20	20	60	100	3
3	PC	RCP23ALPC302	Data Structures Laboratory			2	25				25	50	1
4	PC	RCP23ALPC303	Python Laboratory			4	25				25	50	2
	MD	RCP23ACMD301	Operating Systems	2			20	20	20	20	60	100	2
	OE	RCP23OCOE301	Product Life Cycle Management	3			20	20	20	20	60	100	3
		RCP23OCOE302	Management Information System	3			20	20	20	20	60	100	3
		RCP23OCOE303	Operations Research	3			20	20	20	20	60	100	3
5#		RCP23OCOE304	Personal Finance Management	3			20	20	20	20	60	100	3
		RCP23OCOE305	Public Systems and Policies	3			20	20	20	20	60	100	3
		RCP23OCOE306	Fundamentals of Biomedical Instruments	3			20	20	20	20	60	100	3
		RCP23OCOE307	IPR and Patenting	3			20	20	20	20	60	100	3
		RCP23OCOE308	Entrepreneurship and Startup Ecosystem	3			20	20	20	20	60	100	3
6	SC	RCP23IPSC301	Semester Project-I			2	25				25	50	1
7	HS	RCP23ITHSX01	Professional and Business Communication Tutorial		2		50					50	2
8	HS	RCP23ICHSX03	Economics and Financial Management	2			20	20	20	20	60	100	2
9	EL	RCP23ILELX05	Community Engagement Service			2	25					25	1
			Total	13	2	10	250			100	375	725	20

#Any 1 Elective Course

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Linear Algebra and Optimization Techniques (RCP23ACPC301)

Teaching Scheme	Examination Scheme
Lectures : 03 Hrs./week	Term Test : 20 Marks
Credits : 03	Teacher Assessment : 20 Marks
	End Sem Exam : 60 Marks
	Total Marks : 100 Marks

Prerequisite: Knowledge of

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

2. Calculus.

Course Objectives:

1. Understanding basic concepts of linear algebra.

2. Apply the concepts of vector spaces, linear transformations, matrices and inner product spaces in engineering.

3. To understand the concept of Optimization and enhance the problem solving skills and Optimization techniques.

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Apply the concept of vector spaces, subspaces and the inner product spaces to the engineering problems.	L3	Apply
CO2	Apply the concept of vector spaces using linear transformations which is used in computer graphics and inner product spaces.	L3	Apply
CO3	Apply the concepts of eigenvalue and eigenvectors and diagonalization in linearsystems.	L3	Apply
CO4	Apply the concept of unconstrained optimization techniques to the engineering problems.	L3	Apply

Course Contents

Unit-I   07 Hrs.

Vector Space and Inner Product Spaces:

Preview: Linear combinations of vectors, Linearly dependent and independent vectors. Definition of vector space over R, Subspaces. Basis and Dimension. Dot product in R, Definition of general inner product on a vector space over 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 R^2 and R^3

Unit-II   06 Hrs.

Linear Transformations: Definition and properties. Kernel and image of a linear transformation, Rank-Nullity Theorem. Invertible Linear Transformation, Relation between matrices and Linear Transformations, Change of bases.

Unit-III   07 Hrs.

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.

Unit-IV   06 Hrs.

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

Text Books:

1. Jin Ho Kwak and Sungpyo Hong, "Linear Algebra", 2nd Springer, 2004.

2. Bernard Kolman and David, "Introductory Linear Algebra- An applied first course", 9th Edition, Pearson Education, 2011.

3. Hira & Gupta, "Operation Research", S Chand.

4. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, John Wiley India, 2015.

Reference Books:

1. Stephen Andrilli and David Hecker, "Elementary Linear Algebra", 5th Edition, Academic Press, 2016.

2. Rudolf Lidl, Guter Pilz, "Applied Abstract Algebra", 2nd Edition, Springer 2004.

3. Howard Anton, Robert C Busby, "Contemporary linear algebra", Wiley 2003.

4. Gilbert Strang, "Introduction to Linear Algebra", 5th Edition, Cengage Learning, 2015.

5. S.D. Sharma Kedar Nath, "Operations Research", 2015.

6. Singiresu S.Rao, "Engineering optimization (Theory and Practice)", New Age International publication, 2015.

7. B. S. Grewal, "Higher Engineering Mathematics", 43th Edition, Khanna Publishers, India, 2015.

Evaluation Scheme:

Theory :

Continuous Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

Continuous Assessment (B):

1. Two term tests of 20 marks each will be conducted during the semester.

2. Average of the marks scored in both the tests will be considered for final grading.

End Semester Examination (C):

1. Question paper based on the entire syllabus, summing up to 60 marks.

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

Data Structures (RCP23ACPC302)

Teaching Scheme

Lectures : 03 Hrs./week

Credits   : 03

Examination Scheme

Term Test : 20 Marks

Teacher Assessment : 20 Marks

End Sem Exam : 60 Marks

Total Marks : 100 Marks

Prerequisite: C – Programming

Course Objectives:

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

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Understand the concept of time and space complexity for algorithms.	L2	Understand
CO2	Assimilate the concept of various linear and non-linear data structures.	L2	Understand
CO3	Solve the problem using appropriate data structure.	L3	Apply
CO4	Implement appropriate searching and sorting algorithms for a given problem.	L3	Apply

Course Contents

Unit-I   04 Hrs.

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)

Unit-II   06 Hrs.

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).

Unit-III   07 Hrs.

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.

Unit-IV   08Hrs.

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

Unit-V   06 Hrs.

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

Unit-VI   08 Hrs.

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.

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. Goodritch, R. Tamassia, D. Mount, "Data Structures and Algorithms in C++", Wiley, 2nd Edition, 2011.

3. Kruse, Leung, Tondo, "Data Structures and Program Design in C", 2nd Edition, Pearson Education, 2013.

4. Tenenbaum, Langsam, Augenstein, "Data Structures using C", 2nd Edition Pearson, 2015.

5. Reema Thareja, "Data Structures using C", Oxford, 2017.

6. Seymour Lipschutz, "Data Structures, Schaum's Outline Series", 1st Edition, Tata McGraw-Hill, 2014.

Evaluation Scheme:

Theory :

Continuous Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

Continuous Assessment (B):

1. Two term tests of 20 marks each will be conducted during the semester.

2. Average of the marks scored in both the tests will be considered for final grading.

End Semester Examination (C):

1. Question paper based on the entire syllabus, summing up to 60 marks.

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

Data Structures Laboratory (RCP23ALPC302)

Practical Scheme

Practical : 02 Hrs./week

Credit   : 01

Course Objectives:

The course intends to introduce and familiarize students with data structures, their use in solving real time complex problems and implementation of these data structures. The course also aims to provide mathematical approach for analyzing algorithms using asymptotic notation and for measuring efficiency of algorithms. Finally, the course intends to make students learn various sorting and searching techniques and choose efficient one based on their efficiency.

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Understand of stack and Demonstrate its operations.	L2	Understand
CO2	Demonstrate different types of queue and its operations.	L2	Understand
CO3	Demonstrate various Linked list types and its operations.	L2	Understand
CO4	Demonstrate heap-sort and compare Hashing techniques	L2, L4	Understand, Analyze
CO5	Understand and compare various searching and sorting techniques.	L2, L4	Understand, Analyze

List of Laboratory Experiments(At Least 10)

Suggested 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 menu driven program.

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. Implementations 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 techniques.

A minimum of 08 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.

Evaluation Scheme:

Laboratory:

Continuous Assessment (A):

Laboratory work will be based on RCP23ACPC302 with minimum 08 experiments to be incorporated. The distribution of marks for term work shall be as follows:

1. Performance in Experiments: 05 Marks

2. Journal Submission: 05 Marks

3. Viva-voce: 05 Marks

4. Subject Specific Lab Assignment/Case Study: 10 Marks

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

End Semester Examination (C):

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

Python Laboratory (RCP23ALPC303)

Teaching Scheme
Practical : 04 Hrs./week
Credit   : 02

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Examination Scheme
Teacher Assessment : 25 Marks
End Sem Exam : 25 Marks
Total Marks : 50 Marks

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Prerequisite: 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.

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Understand basic and object-oriented concepts, data structure implementation in python.	L2	Understand
CO2	Apply file, exception handling, text processing concepts in python.	L3	Apply
CO3	Apply database connectivity, client-server communication using python.	L3	Apply
CO4	Utilize libraries like NumPy, Matplotlib, and Pandas for data manipulation, analysis and visualization.	L3	Apply

Course Contents

Unit-I Python basics   04 Hrs.

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.

Unit-II Control Statements and Functions   04 Hrs.

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.

Unit-III Introduction to OOP   08 Hrs.

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.

Unit-IV Python Modules   04 Hrs.

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.

Unit-V Python for Data Science   06 Hrs.

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

List of Laboratory Experiments

1. Write a python program to understand Expressions, Variables, Quotes, Basic Math operations.

2. Write a python program 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 Lambda, Map, and Reduce Functions.

8. Write a python program to implement concept of Function decorators.

9. Write a python program to implement Classes & objects, Constructors.

10. Write a python program to implement Inheritance & Polymorphism.

11. Write a python program to implement Exception handling.

12. Write a python program to understand different File handling operations with exception handling.

13. Write a python program 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.

Minimum 08 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.

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, O'Reilly Media, December 2019.

2. Dan Bader, David Amos, Joanna Jablonski, Fletcher Heisler, "Python Basics: A Practical Introduction to Python", 1st Edition, Real Python, March 2021.

3. Luciano Ramalho, "Fluent Python", 2nd Edition, O'Reilly Media, May 2022.

Evaluation Scheme:

Laboratory:

Continuous Assessment (A):

Laboratory work will be based on RCP23ALPC303 with minimum 08 experiments to be incorporated. The distribution of marks for term work shall be as follows:

1. Performance in Experiments: 05 Marks

2. Journal Submission: 05 Marks

3. Viva-voce: 05 Marks

4. Subject Specific Lab Assignment/Case Study: 10 Marks

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

End Semester Examination (C):

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

Operating Systems (RCP23ACMD301)

Teaching Scheme
Lectures : 02 Hrs./week
Credits : 02

Prerequisite: Programming Language C and Basics of Hardware, i.e., ALU, RAM, ROM, HDD etc

Course Objectives:

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

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Understand the architecture and functionality of computer systems and operating systems.	L2	Understand
CO2	Understand and apply the fundamental concepts of process and thread management and evaluate scheduling algorithm's performance to optimize operating system efficiency.	L3	Apply
CO3	Identify the need of concurrency and apply principles of concurrency to solve classical synchronization problems.	L3	Apply
CO4	Understand and apply deadlock handling strategies.	L2	Understand
CO5	Identify the need for memory management and apply the mechanisms for the same.	L3	Apply

Course Contents

Unit-I Computer system overview   04 Hrs.

Processor, Memory, Cache, I/O modules, System Bus, Multiprocessor and Multicore organization. **Operating System** Objectives, functions and services, Resource manager, Evolution of operating system, Introduction to key terms, Process, Memory management, Operating System structures (monolithic, microkernel), Types of Operating Systems: Batch, Multiprogramming. Multitasking, Time Sharing, Parallel, Distributed, Real-time, Linux, Mobile OS.

Unit-II Process Management   06 Hrs.

Concept of a Process, Process States(5 state model and 7 state model), creation and termination, Process Description, Process Control Block.

Threads: Concept of a Thread, Types of Threads Thread states, Concept of Multithreading,

Scheduling: Types of Schedulers, Types of Scheduling mechanisms, Preemptive and Non-preemptive, Scheduling algorithms and their performance evaluation: FCFS, SJF, SRTF, Priority based, Round Robin.

Unit-III Process Synchronization   06 Hrs.

Concurrency: Principles of Concurrency, Process Interaction.

Mutual Exclusion: Requirements, Hardware Support, Semaphores and Mutex, Monitors

Classical synchronization problems: Producer and Consumer problem, Readers/Writers Problem, Solutions using Semaphore and Monitor.

Unit-IV Deadlock   05 Hrs.

Principles of deadlock, Reusable resources, Consumable Resources, Conditions for deadlock, Resource Allocation Graph, Deadlock Prevention, Deadlock Avoidance: Banker's Algorithm for Single & Multiple Resources, Deadlock Detection and Recovery. Dining Philosophers Problem. Solution using Semaphore and Monitor.

Unit-V Memory Management   05 Hrs.

Memory Management Requirements, Memory Partitioning: Fixed Partitioning, Dynamic Partitioning, Memory Allocation Strategies: Best-Fit, First Fit, Worst Fit, Next Fit, Relocation, Paging, Segmentation. Virtual Memory: Structure of Page Tables, Demand Paging, Structure of Page Tables, Page Replacement Strategies: FIFO, Optimal, LRU, LFU, Thrashing.

Text Books:

1. William Stallings, "Operating System: Internals and Design Principles", 8th Edition, Prentice Hall, 2014. ISBN-10: 0133805913 • ISBN-13: 9780133805918

2. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", John Wiley & Sons, 9th Edition, 2016,ISBN 978-81-265-5427-0.

3. Andrew Tannenbaum, "Operating System Design and Implementation", 3rd Edition, Pearson, 2015.

Reference Books:

1. Maurice J. Bach, "Design of UNIX Operating System", 2nd Edition, PHI, 2004.

2. Achyut Godbole and Atul Kahate, "Operating Systems", 3rd Edition, McGraw Hill Education, 2017.

3. Remy Card, Eric Dumas, Frank Mevel,"The Linux Kernel Book", 1st Edition, Wiley Publications, 2013.

Evaluation Scheme:

Theory :

Continuous Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

Continuous Assessment (B):

1. Two term tests of 20 marks each will be conducted during the semester.

2. Average of the marks scored in both the tests will be considered for final grading.

End Semester Examination (C):

1. Question paper based on the entire syllabus, summing up to 60 marks.

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

Product Life Cycle Management(RCP23OCOE301)

Teaching Scheme
Lectures : 03 Hrs./week
Credits   : 03

Examination Scheme
Term Test : 20 Marks
Teacher Assessment : 20 Marks
End Sem Exam : 60 Marks
Total Marks : 100 Marks

Prerequisite: Knowledge of basic concepts of Management

Course 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.

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Gain knowledge about phases of PLM, PLM strategies and methodology for PLM feasibility study and PDM implementation.	L2	Understand
CO2	Illustrate various approaches and techniques for designing and developing products.	L3	Apply
CO3	Acquire knowledge in applying virtual product development tools.	L3	Apply
CO4	Acquire knowledge in implementation of Environmental aspects in PLM.	L2	Understand

Course Contents

Unit-I   07 Hrs.

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

Unit-II   07 Hrs.

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.

Unit-III   10 Hrs.

Methodological Evolution of Product Design: Concurrent Engineering, Characteristic Features of Concurrent Engineering, Concurrent Engineering, Life Cycle Approach, Characteristic Features of Life Cycle Approach.

The Design for X System, Objective Properties and Design for X Tools, Choice of Design for X Tools and Their Use in the Design Process. New Product Development (NPD) and Strategies, Product Configuration and Variant Management.

Integration of Environmental Aspects in Product Design: Sustainable Development Design for Environment, Need for Life Cycle Environmental Strategies, Useful Life Extension Strategies, End-of-Life Strategies, Introduction of Environmental Strategies into the Design Process, Life Cycle Environmental Strategies and Considerations for Product Design, Tools and techniques for integrated design, Implementation of international standards.

Unit-IV   07 Hrs.

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.

Unit-V   08 Hrs.

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.

Text Books:

1. John Stark, "Product Lifecycle Management: Paradigm for 21st Century Product Realization", Springer-Verlag, 2004, ISBN: 1852338105.

2. Fabio Giudice, Guido La Rosa, Antonino Risitano, "Product Design for the environment-A life cycle approach", Taylor & Francis, 2006, ISBN: 0849327229.

Reference Books:

1. Saaksvuori Antti, Immonen Anselmie, "Product Life Cycle Management", Springer, Dreamtech, 2009, 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", United Kingdom: Wiley, 2010.

Evaluation Scheme:

Theory :

Continuous Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

Continuous Assessment (B):

1. Two term tests of 20 marks each will be conducted during the semester.

2. Average of the marks scored in both the tests will be considered for final grading.

End Semester Examination (C):

1. Question paper based on the entire syllabus, summing up to 60 marks.

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

Management Information System (RCP23OCOE302)

Teaching Scheme
Lectures : 03 Hrs./week
Credits : 03

Prerequisite:NIL

Course 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.

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain the fundamental concepts of the management information systems used in business.	L2	Understand
CO2	Describe IT infrastructure and its components and its current trends.	L2	Understand
CO3	Use the tools and technologies for accessing information from databases to improve business performance and decision making.	L3	Apply
CO4	Identify and explain the security and ethical challenges in MIS along with the measures to be taken.	L2	Understand
CO5	Select a suitable social computing platform for the given requirements that integrates AI and IoT.	L3	Apply
CO6	Explain the processes involved in the information system within the organization includes information acquisition and enterprise and global management technologies.	L2	Understand

Course Contents

Unit-I   04 Hrs.

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.

Unit-II   05 Hrs.

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

- **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

Unit-III   10 Hrs.

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

Unit-IV   08 Hrs.

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.

Unit-V   06 Hrs.

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

Unit-VI   06 Hrs.

- **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

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. James A O'Brien, George M., Ramesh Behl, "Management Information Systems", 11th Edition, Tata McGraw Hill, 2019.

2. Kelly Rainer, Brad Prince, "Management Information Systems", Wiley, 2016.

Web References:

1. Management Information System (https://nptel.ac.in/courses/110105148)

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

Evaluation Scheme:

Theory :

Continuous Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

Continuous Assessment (B):

1. Two term tests of 20 marks each will be conducted during the semester.

2. Average of the marks scored in both the tests will be considered for final grading.

End Semester Examination (C):

1. Question paper based on the entire syllabus, summing up to 60 marks.

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

Operations Research (RCP23OCOE303)

Teaching Scheme

Lectures : 03 Hrs./week

Credits : 03

Examination Scheme

Term Test : 20 Marks

Teacher Assessment : 20 Marks

End Sem Exam : 60 Marks

Total Marks : 100 Marks

Prerequisite: Knowledge of 1. Mathematics, 2. Probability.

Course 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.

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Formulate the real-world optimisation problem into a Linear Programming Problem (LPP) and analyse the solution obtained using LPP optimisation models	L4	Analyze
CO2	Solve Linear Programming Problems using transportation and assignment models.	L3	Apply
CO3	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.	L3	Apply
CO4	Apply Game Theory for decision making under conflicting situations where there are one or more opponents (players).	L3	Apply
CO5	To breaking down a large problem into smaller sub problems and solved recursively or iteratively using Dynamic Programming models.	L4	Analyze

Course Contents

Unit-I   12 Hrs.

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.

Unit-II   08 Hrs.

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

Unit-III   06 Hrs.

Decision Theory: Steps in Decision Theory approach, Decision-making Environment, Decision making under condition of certainty, Decision making under condition of uncertainty, Decision making under condition of risk, Maximum likelihood criterion.

Unit-IV   06 Hrs.

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.

Unit-V   07 Hrs.

Dynamic programming: Characteristics of dynamic programming. Dynamic programming approach for Priority Management employment smoothening, capital budgeting, Stagecoach/Shortest Path, cargo loading and Reliability problems

Text Books:

1. Taha, H. A.,"Operations Research - An Introduction", Pearson Education, 2022.

2. Gupta P. K., Hira D. S.,"Operations Research", S. Chand Limited, 2014.

Reference Books:

1. Boucherie, R. J., Tijms, H. and Braaksma, "A Operations Research: Introduction to Models and Methods", 2021.

2. Hiller, F. S. and Liebermann, G. J, "Introduction to Operations Research", McGraw-Hill Higher Education, 2010.

3. Ravindran, A., Phillips, D. T. and Solberg, J. J, "Operations Research: Principles and Practice", Wiley India Pvt. Limited, 2009.

Evaluation Scheme:

Theory :

Continuous Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

Continuous Assessment (B):

1. Two term tests of 20 marks each will be conducted during the semester.

2. Average of the marks scored in both the tests will be considered for final grading.

End Semester Examination (C):

1. Question paper based on the entire syllabus, summing up to 60 marks.

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

Personal Finance Management
(RCP23OCOE304)

Teaching Scheme	**Examination Scheme**
Lectures : 03 Hrs./week	Term Test : 20 Marks
Credits : 03	Teacher Assessment : 20 Marks
	End Sem Exam : 60 Marks
	Total Marks : 100 Marks

Prerequisite: NIL

Course Objectives:

1. To create awareness and educate consumers on access to financial services.

2. To make the students understand the basic concepts, definitions and terms related to direct taxation.

3. To help the students compute the Goods and Service Tax (GST) payable by a supplier after considering the eligible input tax credit.

4. To familarise the students with microfinance for accelerating the expansion of local microbusinesses.

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Understand the Indian financial system.	L2	Understand
CO2	Use a framework for financial planning to understand the overall role finances play in his/her personal life.	L3	Apply
CO3	Compute income from salaries, house property, business/profession, capital gains and income from other sources.	L3	Apply
CO4	Compute the amount of CGST, SGST and IGST payable after considering the eligible input tax credit.	L3	Apply
CO5	Understand how Microfinance can help in financial inclusion.	L2	Understand

Course Contents

Unit-I   07 Hrs.

Overview of Indian Financial System: Characteristics, Components and Functions of Financial System. Financial Instruments and Financial Markets, Financial inclusion.

Introduction to Personal Finance: Person Financial Planning in Action, Money Management Skills, Taxes in Your Financial Plan, Savings and Payment Services.

Consumer Credit: Advantages, Disadvantages, Sources and Costs.

Unit-II   07 Hrs.

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.

Unit-III   09 Hrs.

Income Tax:

Income Tax Act Basics: Introduction to Income Tax Act, 1961

Heads of Income and Computation of Total Income and Tax Liability: Heads of Income and Computation of Total Income under various heads, Clubbing Provisions, Set off and Carry forward of Losses, Deductions, Assessment of Income and tax liability of different persons.

Tax Management, Administrative Procedures and ICDS: TDS, TCS and Advance Tax Administrative Procedures, ICDS.

Unit-IV   08 Hrs.

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

Unit-V

Introduction to Micro – finance:

Micro-Finance: Definitions, Scope & Assumptions, Types of Microfinance, Customers of Micro-finance, Credit Delivery Methodologies, SHG concept, origin, Formation & Operation of Self Help Groups (SHGs).

Models in Microfinance: Joint Liability Groups (JLG), SHG Bank Linkage Model and GRAMEEN Model: Achievements & Challenges

Institutional Mechanism: Current Challenges for Microfinance, Microfinance Institutions (MFIs): Constraints & Governance Issues, Institutional Structure of Microfinance in India: NGO-MFIs, NBFC-MFIs, Co-operatives, Banks, Microfinance Networks and Associations; Demand & Supply of Microfinance Services in India, Impact assessment and social assessments of MFIs.

Reference Books:

1. Asha Singh, M.S. Gupta, "Banking and Financial Sector Reforms in India" , Serials Publication.

2. M.S. Gupta & J.B. Singh, "Indian Banking Sector: Essays and Issues", 1st Edition, Serials Publication.

3. K.M. Bhattacharya O.P. Agarwal, "Basics Of Banking & Finance", Himalaya Publishing House.

4. S. Subba Reddy , P. Raghu Ram, "Agricultural Finance and Management".

5. Dr.Vasant Desai, "The Indian Financial System and Development", 4th Edition, Himalaya Publishing House.

6. Sanjay Kumar Satapathy, "Income Tax Management Simple Way of Tax Management, Tax Planning and Tax Saving".

7. Dr. R. K. Jain, "Direct Tax System Income Tax", SBPD Publications.

8. S K Mishra, "Simplified Approach to GST Goods and Services Tax", Educreation Publishing.

9. Todd A Watkins, "Introduction To Microfinance", World Scientific Publishing Company.

Evaluation Scheme:

Theory :

Continuous Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

Continuous Assessment (B):

1. Two term tests of 20 marks each will be conducted during the semester.

2. Average of the marks scored in both the tests will be considered for final grading.

End Semester Examination (C):

1. Question paper based on the entire syllabus, summing up to 60 marks.

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

Public Systems and Policies (RCP23OCOE305)

Teaching Scheme	Examination Scheme
Lectures : 03 Hrs./week	Term Test : 20 Marks
Credits : 03	Teacher Assessment : 20 Marks
	End Sem Exam : 60 Marks
	Total Marks : 100 Marks

Prerequisite: Basic Knowledge of Social science and Current affairs.

Course 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 the public policy on firms and economy at large.

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Understand the importance of public systems in a fast-changing environment in the global context.	L2	Understand
CO2	Analyze the transformations in public systems with emphasis on current initiatives and emerging challenges in the field.	L4	Analyze
CO3	Explain public policy and its operations with special focus on policy relating to Government finance.	L2	Understand
CO4	Make policies and know about the happenings in the world, in the nation and those in their locality.	L5	Evaluate
CO5	Analyze and evaluate the impact of public policy on firms and the economy at large and work under various fields as policymakers.	L5	Evaluate

Course Contents

Unit-I   10 Hrs.

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.

Unit-II   06 Hrs.

Public Sector in the Economics Accounts: Public Sector in the circular flow; Public Sector in the National Income Accounts.

Unit-III   08 Hrs.

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.

Unit-IV   10 Hrs.

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.

Unit-V   05 Hrs.

Case Studies in Expenditure Policy: Public Services

A) National Defense B) Highways C) Outdoor Recreation D) Education

Reference Books:

1. Charles Wheelan, "Introduction to Public Policy", W.W. Norton & Company, New York, 2011.

2. Thomas R. Dye, "Understanding Public Policy", Prentice Hall, 2008.

3. Anderson J.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,

8. Richard A. Musgrave and Peggy B. Musgrave, "Public Finance in Theory and Practice", 5th Edition, Mcgraw Hill Book, 2017.

Evaluation Scheme:

Theory :

Continuous Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

Continuous Assessment (B):

1. Two term tests of 20 marks each will be conducted during the semester.

2. Average of the marks scored in both the tests will be considered for final grading.

End Semester Examination (C):

1. Question paper based on the entire syllabus, summing up to 60 marks.

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

Fundamentals of Biomedical Instruments (RCP23OCOE306)

Teaching Scheme	Examination Scheme
Lectures : 03 Hrs./week	Term Test : 20 Marks
Credits : 03	Teacher Assessment : 20 Marks
	End Sem Exam : 60 Marks
	Total Marks : 100 Marks

Prerequisite: Basic knowledge of Human Anatomy, Basic knowledge of Electronics

Course 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.

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Associate & describe the the different physiological processes taking place within the human body.	L2	Understand
CO2	Identify the use of biomaterials and apply principles of various transducers & sensors.	L3	Apply
CO3	Demonstrate the working principle of various medical instruments.	L3	Apply
CO4	Demonstrate principles used in imaging modalities and analysis.	L3	Apply
CO5	Identify different processes used in telemetry and telemedicine.	L2	Understand

Course Contents

Unit-I   04 Hrs.

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

Unit-II   10 Hrs.

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

Unit-III   08 Hrs.

Overview of Medical Instruments

Classification, application and specifications of diagnostic, therapeutic and clinical laboratory equipment

Method of operation of these Bio Medical Instruments

ECG, EEG, EMG

Unit-IV   09 Hrs.

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

Unit-V

08 Hrs.

Telemetry & Telemedicine

Introduction to Biotelemetry

Physiological parameters compliant to biotelemetry

Components of Biotelemetry system

Applications of telemetry in medical field (ECG, EEG & EMG)

Text Books:

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, 2nd Edition, 2003.

4. John G. Webster, "Medical Instrumentation Application and Design", John Wiley and sons, NewYork, 1998.

5. B.D. Ratner, A.S. Hoffmann, F. J. Schoen, J. E. Lemons, "Biomaterials Science - An Introduction to Materials in Medicine", Academic Press, 1997.

Reference Books:

1. Dr Rajendra Prasad, "Electronic Measurement and Instrumentation".

2. Ed. Joseph D. Bronzino, "The Biomedical Engineering Hand Book", 3rd Edition, Boca Raton, CRC Press LLC, 2006.

3. Curry, T. S., Dowdey, J. E., & Murry, R. C., "Christensen's physics of diagnostic radiology". Lippincott Williams & Wilkins, 1990.

4. Joon Park, R. S. Lakes, "Biomaterials: An Introduction", Springer Science & Business Media.

Evaluation Scheme:

Theory :

Continuous Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

Continuous Assessment (B):

1. Two term tests of 20 marks each will be conducted during the semester.

2. Average of the marks scored in both the tests will be considered for final grading.

End Semester Examination (C):

1. Question paper based on the entire syllabus, summing up to 60 marks.

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

IPR and Patenting (RCP23OCOE307)

Teaching Scheme	Examination Scheme
Lectures : 03 Hrs./week	Term Test : 20 Marks
Credits : 03	Teacher Assessment : 20 Marks
	End Sem Exam : 60 Marks
	Total Marks : 100 Marks

Prerequisite: NIL

Course Objectives:

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

2. To encourage innovation.

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Map a given project/ idea to a suitable intellectual property rights.	L3	Apply
CO2	Explain the fundamentals of the patents, copyrights, and design registrations.	L2	Understand
CO3	Draft applications to protect various intellectual property rights.	L6	Create
CO4	Communicate with national and/or international intellectual property organisations.	L4	Analyze

Course Contents

Unit-I   03 Hrs.
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.

Unit-II   09 Hrs.
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.

Unit-III   09 Hrs.
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 prior art search.

- International Patent Classification code.

Unit-IV   **09 Hrs.**

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.

Unit-V   **09 Hrs.**

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.

Text Books:

1. A Durafe and D Toradmalle, "Intellectual Property Rights", Wiley, 2020.

2. H Rockman, "Intellectual property law for engineers, scientists, and entrepreneurs", Wiley-IEEE Press, 2020.

Reference Books:

1. Bare Act, "The Patents Act, 1970 with The Patents Rules, 2003", Universal, 2023.

2. Bare Act, "The Copyright Act, 1957", Universal and LexisNexis, 2021.

3. Bare Act, "The Designs ACT, 2000", Commercial Law Publishers (India) Pvt. Ltd. 2021

Online Resources:

1. W. Fisher, "Maps of Intellectual Property" https://cyber.harvard.edu/people/tfisher/IP/IPMaps.htm

2. World Intellectual Property Organisation courses https://www.wipo.int/academy/en/

3. Prof. Feroz Ali, "Patent Drafting for Beginners", https://onlinecourses.nptel.ac.in/noc24_hs59/preview

Evaluation Scheme:

Theory :

Continuous Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

Continuous Assessment (B):

1. Two term tests of 20 marks each will be conducted during the semester.

2. Average of the marks scored in both the tests will be considered for final grading.

End Semester Examination (C):

1. Question paper based on the entire syllabus, summing up to 60 marks.

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

Entrepreneurship and Startup Ecosystem (RCP23OCOE308)

Teaching Scheme	**Examination Scheme**
Lectures : 03 Hrs./week	Term Test : 20 Marks
Credits : 03	Teacher Assessment : 20 Marks
	End Sem Exam : 60 Marks
	Total Marks : 100 Marks

Prerequisite: NIL

Course Objectives:

1. To foster an entrepreneurial mindset.

2. To guide in building effective Business Models.

3. To educate regarding Intellectual property and Fundraising for Innovative Ventures.

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Effectively Navigate the Global Startup Landscape.	L3	Apply
CO2	Cultivate an Entrepreneurial Mindset.	L4	Analyze
CO3	Create Effective Business Models.	L6	Create
CO4	Understand the significance of Intellectual Property rights.	L2	Understand
CO5	Master Fundraising Strategies.	L5	Evaluate

Course Contents

Unit-I   06 Hrs.

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

Unit-II   08 Hrs.

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

Unit-III   10 Hrs.

Business Model Development

- Introduction to Business Models

- Lean Startup Methodology

- Prototyping and Minimum Viable Product (MVP)

- Financial Projections and Budgeting

- Various forms of Business Ownership

- Compliance and Legal Regulations

- Operations and Supply Chain Management

- Human Resource Management

- Developing a marketing Strategy

- Managing Growth Challenges

Unit-IV   08 Hrs.

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

Unit-V   07 Hrs.

Fundraising and Investment Strategies

- Fundraising Options for Startups

- Angel Investors and Venture Capital

- Crowdfunding Platforms

- Financial Modelling for Startups

- Crafting an Effective Pitch

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", John Wiley & Sons, Inc., Hoboken, New Jersey, 2016.

4. Christensen, Clayton M. "The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail", Boston, MA: Harvard Business School Press, 1997.

5. Brad Feld and Jason Mendelson, "Venture Deals: Be Smarter Than Your Lawyer and Venture Capitalist", Wiley, 4th Edition, 1 October 2019.

Evaluation Scheme:

Theory :

Continuous Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

Continuous Assessment (B):

1. Two term tests of 20 marks each will be conducted during the semester.

2. Average of the marks scored in both the tests will be considered for final grading.

End Semester Examination (C):

1. Question paper based on the entire syllabus, summing up to 60 marks.

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

Semester Project-I (RCP23IPSC301)

Practical Scheme
Practical : 02 Hrs./week
Credit : 01

<div align="right">

Examination Scheme
Teacher Assessment : 25 Marks
End Sem Exam : 25 Marks
Total : 50 Marks

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Course Objectives:

Students are expected to design, simulate/implement a project based on the knowledge acquired from current semester subjects.

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Conduct a survey of several available literatures in the preferred field of study.	L4	Analyze
CO2	Demonstrate various/alternate approaches to complete a project.	L2	Understand
CO3	Ensure a collaborative project environment by interacting and dividing project work among team members.	L3	Apply
CO4	Present their project work in the form of a technical report / paper and thereby improve the technical communication skill.	L3	Apply
CO5	Demonstrate the ability to work in teams and manage the conduct of the research study.	L2	Understand

Semester Project:

The purpose of semester project is to provide exposure to students with a variety of projects based on the knowledge acquired from the semester subjects. This activity is supposed to enrich their academic experience and bring enough maturity in student while selecting the project. Students should take this as an opportunity to develop skills in implementation, presentation and discussion of technical ideas/topics. Therefore, proper attention shall be paid to the content of semester project report which is being submitted in partial fulfillment of the requirements of the Second Year and it is imperative that a standard format be prescribed for the report.

Each student shall work on project approved by departmental committee approved by the Head of Department, a group of 03 to 05 students (max allowed: 5 students in extraordinary cases, subject to the approval of the department committee and the Head of the department) shall be allotted for each Semester Project. Each group shall submit at least 3 topics for the Semester Project. The departmental committee shall finalize one topic for every group. Semester Project Title or Theme should be based on knowledge acquired during semester. The project work shall involve sufficient work so that students get acquainted with different aspects of knowledge acquired from semester subjects.

Student is expected to:

- Select appropriate project title based on acquired knowledge from current semester subjects.

- Maintain Log Book of weekly work done(Log Book Format will be as per Table 1).

- Report weekly to the project guide along with log book.

Assessment Criteria:

- At the end of the semester, after confirmation by the project guide, each project group will submit project completion report in prescribed format for assessment to the departmental committee (including project guide).

- Assessment of the project (at the end of the semester) will be done by the departmental committee (including project guide).

Prescribed project report guidelines:

Size of report shall be of minimum 25 pages. Project Report should include appropriate content for:

- Introduction

- Literature Survey

- Related Theory

- Implementation details

- Project Outcomes

- Conclusion

- References

Assessment criteria for the departmental committee (including project guide) for Continuous Assessment:

Guide will monitor weekly progress and marks allocation will be as per Table 2.

Assessment criteria for the departmental committee (including project guide) for End Semester Exam:

Departmental committee (including project guide) will evaluate project as per Table 3.

Each group shall present/publish a paper based on the semester project in reputed/peer reviewed Conference/Journal/TechFest/Magazine before end of the semester.

Table 1: Log Book Format

Sr	Week (Start Date:End Date)	Work Done	Sign of Guide	Sign of Coordinator
1				
2				

Table 2: Continuous Assessment Table

Sr	Exam Seat No	Name of Student	Student Attendance	Log Book Maintenance	Literature Review	Depth of Understanding	Report	Total
			5	5	5	5	5	25

Table 3: Evaluation Table

Sr	Exam Seat No	Name of Student	Project Selection	Design/ Simulation/ Logic	Hardware/ Programming	Result Verification	Presentation	Total
			5	5	5	5	5	25

Professional and Business Communication Tutorial (RCP23ITHSX01)

Practical Scheme
Tutorial : 02 Hrs./week
Credit   : 02

Examination Scheme
Teacher Assessment : 50 Marks
Total : 50 Marks

Prerequisite: Nil

Course Objectives:

1. To inculcate professional and ethical attitude at the workplace.

2. To enhance communication and interpersonal skills.

3. To develop effective employability skills .

4. To hone written skills for technical documentation .

Course Outcomes:

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Apply group discussion techniques in professional situations	L3	Apply
CO2	Use employability skills to optimize career opportunities	L3	Apply
CO3	Employ storytelling techniques for effective presentation	L3	Apply
CO4	Prepare technical documents using appropriate style, format, and language	L6	Create
CO5	Analyze the concept of professional ethics.	L4	Analyze
CO6	Demonstrate interpersonal skills in professional and personal situations	L3	Apply

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

Description of Tutorial Activities

Unit-I

No of Assignment -01

Group Discussion

- Purpose of a GD, types of GD, criteria for evaluating GD, Dos and Don'ts of GD.

- **Activity:** Students will be divided into groups of 8-12 and each group will be given a topic/case to discuss within a given time frame. Each student will submit a write-up on their observations of the GD.

Unit-II

No of Assignments -02

Employment Skills

- **Resume Writing:** Types of resumes, structure, content, and formatting of resume.

- **Activity:** Students will prepare and submit their individual resume according to professional requirements.

- **Interview Skills:** Types and modes of interview, preparation for interview, Dos and Don'ts of interview, frequently asked questions during interview.

- **Activity:** Students will submit a write-up on the FAQs and participate in mock interviews.

Unit-III

No of Assignment -01

Corporate Storytelling

- Elevator pitch, product stories, event stories, stories in presentations, storytelling in SOPs and interviews, storytelling to manage conflict or to motivate.

- **Activity:** Students will be divided into groups of 8-12 and asked to give a team presentation using storytelling techniques and submit the hardcopy of the PPT.

Unit-IV   No of Assignment -01

Technical Writing and Documentation

- Business Proposal Writing: Types of business proposals, format of proposal, language and style, presentation of proposal.

- Meeting Documentation: Planning layout of meetings, observing meeting decorum, drafting notice, agenda, and minutes of meeting.

- **Activity:** Students will be divided into groups of 8-12 and each group will conduct a mock meeting based on an agenda and submit a write-up of the meeting documentation.

Unit-V   No of Assignment -01

Professional Ethics

- Effective work habits, accountability, integrity, and excellence.

- **Activity:** Students will be divided into groups of 8-12 and each group will analyze a case involving an ethical issue and submit the write-up.

Unit-VI   No of Assignment -02

Interpersonal Skills

- Team Building: Difference between group and team, importance of teamwork, strategies to be a good team player

- **Activity:** The students will be divided into groups of 8-12 and each group will be assigned a task to be accomplished as a team, for which they will submit the writeup.

- Leadership: Types of leadership, leadership styles, case studies.

- **Activity:** Each student will submit a writeup involving a leader they admire, analysing various aspects of his leadership style.

- Time Management: Importance of time management, cultural views of time, 80/20 rule, time wasters, setting priorities and goal.

- **Activity:** Each student will submit a writeup about a case involving time management.

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

Books Recommended:

1. Fred Luthans, "Organizational Behavior", 12th Edition, McGraw Hill, 2010.

2. Lesika and Pettit, "Report Writing for Business", 9th Edition, McGraw Hill, 1994.

3. Huckin and Olsen, "Technical Writing and Professional Communication", 2nd Edition, McGraw Hill, 1991.

4. Wallace and Masters, "Personal Development for Life and Work", 12th Edition, Thomson Learning, 2010.

5. Herta Murphy, "Effective Business Communication", 7th Edition, McGraw Hill, 2017.

6. Sharma R. C. and Krishna Mohan, "Business Correspondence and Report Writing", 5th Edition, Tata McGraw-Hill Education, 2017.

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

8. Bell, Smith, "Management Communication", 3rd Edition, Wiley India Edition, 2014.

9. Dr. Alex, K., "Soft Skills", 3rd Edition, S. Chand and Company, 2009.

10. Subramanian R., "Professional Ethics", 2nd Edition, Oxford University Press, 2017.

11. Sandeep Das, "How Business Story Telling Works: Increase Your Influence and Impact", Penguin Random House India Pvt. Ltd., 2023.

Evaluation Scheme:

Continuous Assessment (A):

Term Work: 50 marks.

Term Work shall comprise of: Minimum 8 assignments: 25 marks.

Business Proposal presentation: 25 marks.

Economics and Financial Management (RCP23ICHSX03)

| Teaching Scheme	Examination Scheme
Lectures : 02 Hrs./week	Term Test : 20 Marks
Credits : 02	Teacher Assessment : 20 Marks
	End Sem Exam : 60 Marks
	Total Marks : 100 Marks

Prerequisite: Knowledge of Economics and Finance domain current affairs.

Course Objectives:

- To describe the relationships among variables to analyse economic issues.

- To Explain the function of the market and prices as an allocative mechanism.

- To identify key macroeconomic indicators and measures of economic change, growth, and development.

- To understand basic concepts of financial management and their application in investment and financing decisions.

- To explore the relationship between Financial Management and Financial Statements.

Course Outcomes:

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Analyse individual decision making, how prices and quantities are determined in product and factor markets, microeconomic and macroeconomic outcomes.	L4	Analyze
CO2	Analyse the performance and functioning of government, RBI, markets, and institutions in the context of social and economic problems.	L4	Analyze
CO3	Analyse the current economic status of India at global levels and provision in budget to address economic issues at national level.	L4	Analyze
CO4	Describe an understanding of the overall role and importance of the finance function.	L2	Understand
CO5	Analyse financial performance and make appropriate inferences..	L4	Analyze
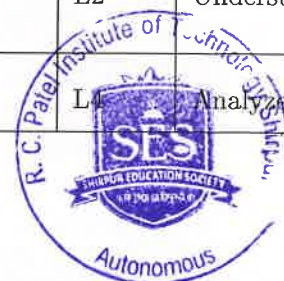
Course Contents

Unit-I   06 Hrs.

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).

Unit-II   04 Hrs.

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.

Unit-III   04 Hrs.

Government Policies: Last 20 years Journey of Indian Economy, Measures taken to grow Indian Economy, Meaning of India is the world's fifth-largest economy by nominal GDP and the third-largest by purchasing power parity (PPP), On a per capita income basis, India ranked 139th by GDP (nominal) and 127th by GDP (PPP) (Data reference year 2023), Comparison of top 5 largest economies in world, Discuss key points of India latest union budget and its impact on Indian economy and citizens, Meaning of Initiatives like Make in India, Digital India, Skill India etc. and expected impact on Indian Economy.

Unit-IV   04 Hrs.

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.

Unit-V   08 Hrs.

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.

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, 2nd Edition, 2023.

5. Financial Management Practices in India by Sandeep Goel, Taylor & Francis Publications, 2016.

Evaluation Scheme:

Theory:

Continuous Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

Continuous Assessment (B):

1. Two term tests of 20 marks each will be conducted during the semester.

2. Average of the marks scored in both the tests will be considered for final grading.

End Semester Examination (C):

1. Question paper based on the entire syllabus, summing up to 60 marks.

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

Community Engagement Service (RCP23ILELX05)

Practical Scheme	Examination Scheme
Practical : 02 Hrs./week	Teacher Assessment : 25 Marks
Credit : 01	Total : 25 Marks

Prerequisite: Fundamentals of core branch, Communication Skills

Course Objectives:

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

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	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	L3	Apply
CO2	Identify and experience commitment for community engagement activities that reinforce sense of belongingness and gratitude towards societal cause	L5	Evaluate
CO3	Witness diversity in communities and cultures and demonstrate change in approach / attitude as, an evidence of unconditional acceptance.	L3	Apply
CO4	Recognise, experience and value, effectiveness of working in a team, demonstrating co-existence of the roles - sincere worker and effective leader.	L5	Evaluate

Course Contents

Unit-I

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 child / 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.

Unit-II

Technical (Program core related)

Cyber-crime, security awareness and vulnerabilities – sensitization, information dissemination and awareness sessions in indicated focus areas.

Promotion and Sensitization for Sustainable living – focusing on solar power, water recycling, e-waste responsible disposal, waste recycling etc. in indicated focus areas.

Focus areas: residential societies, schools, under-privileged areas, governments /private offices, and similar other establishments.

OR

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

Activities to be performed

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

Suggested Activities

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

Typical suggested tabulation.

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

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

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

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

2. Ex. 1 Milk Adulteration: https://www.youtube.com/watch?v=pbnmeRUBxKk

3. Ex.2 Watermelon Adulteration: https://www.youtube.com/watch?v=yrLAj7oJies

Product	Adulterant	Testing Method	Result	Remarks

Certificates and Formats:

Activity Endorsement Certificate

Date:

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

Course objective: To sensitise the student / learner into recognising social problems and 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 PRN _____ is a student of S.Y. B.Tech., _____ branch of engineering. He / She is a bonafide student of SES's R. C. Patel Institute of Technology, Shirpur. 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	
PRN	Date
Program	Time
Class/Div	Address

I, the undersigned _____ accept the following terms and conditions unconditionally:

1. I accept and understand that the community activity identification and selection has been done willingly by me.

2. I undertake to convey that, I am apparently in good health and well-being, and suffer no physical impairment that would or should prevent my participation in the activity.

3. I undertake to bear all related expenses and risk of travel related to the activity and shall not hold any personnel from the institute responsible with regards to claims and / or loss in the process of conduct of activity.

4. I undertake that my parents or legal/local guardians are aware of said activity and agree to above mentioned terms and conditions.

Student's name & Signature: _____

Parent or Guardian's name & signature: _____

Guidelines for Assessment of the work

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

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

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

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

Forms for Technical Activity:

1. Activity Conduction Report

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

2. Participant feedback (online / offline):

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

Evaluation Scheme:

Continuous Assessment (A):

Term Work:- 25 marks, distribution as herewith:

1. Rubric for Open Ended Activity (10 marks)

   - Participation certificate/proof

2. Rubric for Technical Activity (15 marks)

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

OR

3. Rubric for Field Survey Activity:

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