D. Y. PATIL DEEMED TO BE UNIVERSITY
SCHOOL OF ENGINEERING AND MANAGEMENT
Teaching and Evaluation Scheme from Year 2023-24 (as per NEP-2020)
B. Tech. Data Science Engineering (SEMESTER- III)

Sr. No.	Course Code	Course Type	Course Name	Teaching Scheme				Theory			Practical		Total Marks
				Credits	Contact Hrs			ISE	MSE	ESE	INT	OE/ PoE	
					L	P	T						
1	23DSEU3P01	PCC	Probability & Statistics	**3**	3	-	-	20	30	50	-	-	100
2	23DSEU3P02	PCC	Data Structures	**3**	3	-	-	20	30	50	-	-	100
3	23DSEU3P03	PCC	Data Structures Laboratory	**1**	-	2	-	-	-	-	25	25	50
4	23DSEU3P04	PCC	Programming Lab - I	**3**	2	2	-	-	-	-	50	50	100
5	23DSEU3M05	MDM-I	Fundamentals of Data Science	**2**	2	-	-	-	-	50	-	-	50
6	23DSEU3O06	OEC-I $	Data Science for Engineers	**3**	3	-	-	20	30	50	-	-	100
7	23DSEU3O07	OEC-I $	Data Science for Engineers Laboratory	**1**	-	2	-	-	-	-	25	-	25
8	23DSEU3F08	CEP/FP	Domain Specific Mini Project	**2**	-	4	-	-	-	-	25	25	50
9	23DSEU3V09	VEC	Environmental Studies	**2**	2	-	-	-	-	50	-	-	50
10	23DSEU3H10	HSSM	Economics and Management for IT	**2**	2	-	-	-	-	50	-	-	50
11	23DSEU3D11	AC	Liberal Learning	**-**	2*	-	-	-	-	-	50*	-	
12	23DSEU3D12	AC	Finishing School Training - III	**-**	2*	-	-	-	-	-	50*	-	
			Total	**22**	**17**	**10**	**0**						**675**

Prof T. B. Patil

Course Code:	23DSEU3P01
Course Name:	Probability & Statistics

L	T	P	Credit
3			3

Course Prerequsites:

Basic Probability Theory

Course Description:

This course plays important role in Data Science. This course provides fundamentals of probability and statistics which required for Data Science. This course focuses on dispersion and measure of central tendency, testing hypothesis, correlation and regression, probability distribution and recurrence relation.

Course Outcomes: After the completion of the course the student will be able to -

CO1	Apply the knowledge to study the data given with respect to dispersion and measure of Central tendency
CO2	Understand tests for hypothesis and its significance.
CO3	Describe the statistical data numerically by using correlation and regression.
CO4	Solve basic problems in probability theory, including problems involving the binomial, Poisson and normal distributions.
CO5	Apply the recurrence relation to solve the counting problems and program analysis problems.
CO6	Make use of method of least squares to fit the curves for bivariate data.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2			2								1	
CO2	3	2											1	
CO3	3	2			2								1	
CO4	3	2			2								1	
CO5	3	2			2								1	
CO6	3	2			2								1	

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	ISE	20 Marks	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	MSE	30 Marks	50% of course contents
3	ESE	50 Marks	100% course contents

Course Contents:

Unit 1	**Frequency distribution and measure of central Tendency**	**6 Hours**
Frequency distribution, Continuous frequency distribution, Graphical representation of a Frequency distribution- Histogram, frequency polygon, Measure of central tendency- Arithmetic mean, median and mode, Range, Quartile deviation, Mean deviation, Standard deviation		
Unit 2	**Testing of hypothesis**	**6 Hours**
Introduction, Statistical hypothesis (Simple and Composite), Null hypothesis, Alternative hypothesis, Critical region, Type I and Type II errors, Level of significance, Test for Goodness of fit of chi square distribution and t- distribution.		
Unit 3	**Correlation and Regression**	**6 Hours**
Introduction, Types of correlation, Karl Pearson's coefficient of correlation, Interpretation of the coefficients of corrections, Computation of coefficient of correlation for ungroup data, Lines of regression , Calculations of equations of the lines of regression		
Unit 4	**Probability Distribution Functions**	**6 Hours**
Introduction, Elementary theory of probability, Random variables. Discrete probability distribution, Continuous probability distribution, Binomial distribution, Poisson distribution, Normal distribution.		
Unit 5	**Recurrence Relation**	**6 Hours**
Introduction, Definition of recurrence relation, Linear recurrence relation with constant coefficients, Construction of recurrence relation, Solution of recurrence relation- Homogeneous and non-homogeneous, Solution of homogeneous and non-homogeneous recurrence relation.		
Unit 6	**Curve Fitting**	**6 Hours**
Fitting of curve by method of lest squares, Fitting of straight lines, Fitting of exponential curve, Fitting of second degree parabolic curve.		

Text Books:

1. Walpole, Myers, Myers, Ye, Probability and Statistics for Engineers and Scientists, Pearson Education Inc., 8th Edition, 2007, ISBN: 978-81-317-1552-9.
2. Numerical Methods in Engineering and Science, by Dr. B.S. Grewal, Khanna Publishers, Delhi.
3. Advanced Engineering Mathematics, by H. K. Dass, S.Chand, New Delhi.

Reference Books:

1. Douglas C Montgomery, George C Runger, Applied statistics and Probability for Engineers, Wiley Asia Student Edition, 4th Edition, 2007, ISBN: 978-81-265-2315
2. Richard I Levin, David S Rubin, Statistics for Management, Prentice Hall India, 7th Edition, 1997, ISBN: 9780134762920.
3. Purna Chandra Biswal, Probability and Statistics, PHI Learning Private Limited, Eastern Economy Edition, 2007, ISBN: 978-81-203-3140-2

Course Code:	23DSEU3P02
Course Name:	Data Structures

L	T	P	Credit
3			3

Course Prerequsites:

1. Basic Knowledge of C
2. Basic mathematical Approach

Course Description:

The course is designed to develop skills to design and analyze simple linear and non linear data structures. It strengthen the ability to the students to identify and apply the suitable data structure for the given real world problem. It enables them to gain knowledge in practical applications of data structures

Course Outcomes: After the completion of the course the student will be able to -

CO1	Illustrate the concepts of Data Structures
CO2	Identify the appropriate data structure for specific application
CO3	Choose appropriate sorting and searching algorithms.
CO4	Outline the solution to the given software problem with appropriate data structure
CO5	

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1													
CO2	2	3	2	2	2				1					1
CO3	1	1	2	2	2				1					1
CO4	1	3	1	2	1				1					3
CO5														

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents

Course Contents:		
Unit 1	**Basic of Data Structures**	**4 Hours**
Data structure- Definition, Types of data structures, Data Structure Operations, Algorithms: Complexity, Time and Space complexity.		
Unit 2	**Stacks and Queues**	**7 Hours**
Stack: Definition, operations, Array representation of stack, applications Queue: Definition, operations, Array representation of queue, applications, Circular queue, Priority queue, Deque.		
Unit 3	**Linked Lists**	**8 Hours**
Definition, representation, operations, implementation and applications of singly, doubly and circular linked lists. Linked representation of stack and Queue.		
Unit 4	**Trees**	**7 Hours**
Terminology, representation, binary tree, traversal methods, binary search tree, AVL tree (Introduction), Heaps- Operations and their applications		
Unit 5	**Graphs**	**6 Hours**
Basic concept of graph theory, storage representation, graph traversal techniques- BFS and DFS		
Unit 6	**Searching and Sorting Techniques**	**7Hours**
Searching: Linear search, Binary search Sorting: Bubble sort, Selection sort, Insertion sort, Merge sort, Quick sort, Heap Sort Complexity and analysis of Searching and Sorting Algorithms		

Text Books:

1. Schaum's Outlines Data Structures – Seymour Lipschutz (MGH)
2. Data Structures- A Pseudo code Approach with C – Richard F. Gilberg and Behrouz A. Forouzon 2nd Edition

Reference Books:

1. Data Structure using C- A. M. Tanenbaum, Y. Langsam, M. J. Augenstein (PHI)
2. Fundamentals of Data Structures - Horowitz, Sahani (CBS India)

Course Code:	23DSEU3P03
Course Name:	Data Structures Lab

L	T	P	Credit
		2	1

Course Prerequsites:

1. Basic Knowledge of C
2. Basic mathematical Approach

Course Description:

The course is designed to develop skills to design and analyze simple linear and non linear data structures. It strengthen the ability to the students to identify and apply the suitable data structure for the given real world problem. It enables them to gain knowledge in practical applications of data structures

Course Outcomes: After the completion of the course the student will be able to -

CO1	Implement the Various Data Structures
CO2	Implement the various sorting and searching algorithms.
CO3	Compare the complexities of various algorithms
CO4	

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1		1	1							1	2
CO2	3	1	1		1	1								1
CO3	3	3	2	3	3				1	1	1		1	3
CO4														

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation (ISE)	50%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	End Semester Examination (ESE)	50%	Practical Oral Exam

List of Experiments:

1. Write a C program to implement operations on Stack using array
2. Write a C program to implement operations on Linear Queue using array
3. Write a C program to implement operations on Circular Queue using array
4. Write a C program to implement operations on Singly Linked list
5. Write a C program to implement operations on Doubly Linked list
6. Write a C program to implement operations on Circular Linked list
7. Write a C program to implement Searching Techniques
8. Write a C program to implement Bubble sorting Techniques
9. Write a C program to implement Selection Sort Technique
10. Write a C program to implement Insertion Sort Technique
11. Write a C program to implement BST and its traversal
12. Write a C program to implement BFS and DFS

Course Code:	23DSEU3P04
Course Name:	Programming Lab - I

L	T	P	Credit
2	0	2	3

Course Prerequsites:

1. Procedural Programming Language (C Language)

Course Description:

This course introduces students to the principles of object-oriented programming using C++. Students will develop practical skills through hands-on coding exercises and projects, learning to design and implement efficient, reusable, and maintainable code using OOP concepts.

Course Outcomes: After the completion of the course the student will be able to -

CO-1:	explain object oriented concepts, principles and techniques.
CO-2:	create well-structured classes with appropriate data members and member functions, demonstrating proper encapsulation principles.
CO-3:	apply various object-oriented features to solve real-life problems using C++ language.
CO-4:	demonstrate an understanding of generic programming concepts.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1									1	1		3		
CO2	1	1	2		3			2	1	2			3	3
CO3	1	2	2		3			2	1	1		3	3	3
CO4	1				3				1				2	

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents

Course Contents:

Unit 1	**Introduction to Pointers & Structures in C**	**6 Hours**
Pointers: What Are Pointers?, Pointer Variables, The Pointer Operators, Pointer Expressions, Pointers and Arrays, Array of Pointers, Initializing Pointers, Pointers to Functions and structures, C's Dynamic Allocation Functions. Structures: Structures, Arrays of Structures, Passing Structures to Functions, Structure Pointers, Unions, Macro expansion.		
Unit 2	**Fundamentals of C++ Programming**	**8 Hours**
C++ Program Structure, variables, operators, Input/output – I/O streams and standard I/O devices, cin and associated functions, cout and formatted output. User Defined function - declaration, definition & calling function, storage classes, scope rules, function - default arguments. Reference and reference arguments to the function. Pointer variables, new and delete operator, dynamic arrays. Class & Objects: Object Oriented fundamentals, Class and object - concept and need, Class declaration, Class members - member variables and functions, access specifiers, implementation of member functions. Object Declaration, Accessing class members, class scope, . Constructors, invoking a constructor, constructors and default parameters, array of objects and constructor, destructor. this pointer, static members, constant objects and member function, Data abstraction, structure and class, information hiding		
Unit 3	**Inheritance**	**4 Hours**
Inheritance: concept, implementation, base classes and derived classes, members in base classes and derived classes, overriding base class members, UML notations for inheritance, constructors of derived and base classes, destructor in derived class, Inheritance as public, protected and private Composition (Aggregation) and association – concept, implementation and UML Notation		
Unit 4	**Polymorphism**	**4 Hours**
Polymorphism: Need, concept, implementation using function overloading, Multiple Inheritance, function overriding, virtual function, pure virtual function, abstract classes, Friend function and friend classes, accessing base class functions from derived class objects, accessing derived class functions from base class objects. Operator overloading: fundamentals of operator overloading, overloading binary operators, overloading unary operator		
Unit 5	**Generic Programming with Templates**	**4 Hours**
Introduction to Generic Programming, Concept and benefits, Type-independent code Function Templates: Syntax and basic usage, Multiple template parameters, Explicit instantiation and specialization Class Template: Syntax and implementation		

Text Books:

1. Object oriented Programming in C++ 3rd Edition-R.Lafore (Galgotia Publications)
2. C++programming – John Thomas Berry(PHI)
3. Object –Oriented Analysis & Design: Understanding System Development with UML 2.0 , Docherty, Wiley India Ltd.

Reference Books:

1. C++ Programming with language - Bjarne Stroustrup, AT & T

Course Code:	23DSEU3M05
Course Name:	Fundamentals of Data Science

L	T	P	Credit
2			2

Course Prerequsites:

Basic knowledge of computer, Basic knowledge of Mathematics

Course Description:

The aim of the course is to get basic knowledge about data science and its processes. This course also aims to visualize the complex data using different data visualization tools. It also provides different statistical methods to perform data analysis.

Course Outcomes: After the completion of the course the student will be able to -

CO1	Summarize the basic concepts in data science.
CO2	Identify the data science process for the problem solving.
CO3	Choose the appropriate data visualization technique for the given problem.
CO4	Use different statistical methods for data analysis.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1													
CO2	2	1		1									2	
CO3	1	2			2								3	
CO4	2			1										

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	ISE	20 Marks	
2	ESE	30 Marks	

Course Contents:		
Unit 1	**Data Science and its scope**	**4 Hours**
What is Data Science, A Brief History, Difference between Data Science and Data Analytics, Knowledge and Skills for Data Science Professionals, Some Technologies used in Data Science, Benefits and uses of Data Science, Facets of Data.		
Unit 2	**Data Science Process**	**6 Hours**
Overview, Defining research goals and creating a project charter, Retrieving data, Cleansing, integrating, and transforming data, Exploratory data analysis, Build the models, Presenting findings and building applications on top of them.		
Unit 3	**Data Visualization**	**5 Hours**
Introduction to data visualization, Visual encoding, Data visualization software, Data visualization libraries, Basic data visualization tools, Specialized data visualization tools, Advanced data visualization tools, Visualization of geospatial data, Data visualization types		
Unit 4	**Statistical Data Analysis**	**6 Hours**
Role of statistics in data science, Kinds of statistics - Descriptive statistics, Inferential statistics, Probability theory - Random variables, Independence, Sample space, Odds and risks, Expected values, Standard errors, Bayesian probability, Probability distribution		

Text Books:

1. Davy Cielen, Arno D. B. Meysman, Mohamed Ali, "Introducing Data Science", Manning Publications.
2. DR. Gypsi Nandi, DR. Rupam Kumar Sharma, "Data Science Fundamentals and Practical Approaches", BPB Publications, India , ISBN 978-93-89845-662

Reference Books:

1. DR. Amar Sahay, "Essentials of Data Science and Analytics", O'REILLY Publication.
2. https://onlinecourses.nptel.ac.in/noc21_cs23/preview

Course Code:	23DSEU3O06
Course Name:	Data Science for Engineers

L	T	P	Credit
3			3

Course Prerequsites:

1. Fundamentals of Data Science

Course Description:

This course introduces students to data analysis and visualization in the field of exploratory data science.

Course Outcomes: After the completion of the course the student will be able to -

CO1	Describe a flow process for data science problems and classify them into standard typology .
CO2	Develop R codes for data science solutions and correlate results to the solution approach followed .
CO3	Construct use cases to validate approach and identify modifications required.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	2	2	1	2							
CO2	2	2	2	3	3	1	3	2	1					
CO3	1	3	3	3	3	2	3	3						

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents

Course Contents:		
Unit 1	**Introduction to R**	**6 Hours**
R Studio, Variables and datatypes in R, Data frames, Arithmetic,Logical and Matrix operations in R, Advanced programming in R _ Functions, Control structures, Data visualization in R Basic graphics.		
Unit 2	**Linear algebra for data science**	**8 Hours**
Algebraic view - vectors, matrices, product of matrix & vector, rank, null space, solution of over-determined set of equations and pseudo-inverse) Geometric view - vectors, distance, projections, eigenvalue decomposition.		
Unit 3	**Statistics**	**8 Hours**
Descriptive statistics, notion of probability, distributions, mean, variance, covariance, covariance matrix, understanding univariate and multivariate normal distributions, introduction to hypothesis testing, confidence interval for estimates.		
Unit 4	**Optimization**	**6 Hours**
Optimization, Typology of data science problems and a solution framework.		
Unit 5	**Logsitic Regression**	**6 Hours**
Classification using logistic regression.		
Unit 6	**Classification and clustering**	**6 Hours**
Classification using kNN and k-means clustering		

Text Books:

1. Data Communications and Networking – Behrouz A Forouzan (The McGraw Hill) (Unit 1,2,3)
2. Computer Networks – Andrew S. Tanenbaum- (Prentice Hall) 5th Edition (Unit 3, 4)
3. TCP/IP Protocol Suite- Behrouz Forouzan-(The McGraw Hill) (4,5,6)

Reference Books:

1. Computer Networking with Internet Protocols and Technology, William Stallings (Prentice Hall)

Course Code:	23DSEU3F08	L	T	P	Credit
Course Name:	Domain Specific Mini Project			4	2

Course Prerequsites:

1. Data Structures
2. Problem Solving Using C
3. Software Engineering

Course Description:

This course emphasis on a problem-based learning approach. It is a group activity where students have to present an idea / solution for the problem chosen. Then requirement analysis and design specification of the system is to be developed by the students. This is followed by software design, implementation, testing and finally demonstrate the results obtained. This course helps the students to learn how to analyze the demands of a customer and represent them in the form of software requirements specification (SRS) document including quality requirements. Ultimately this course enhances students programming skills and enable them to learn how to perform requirement analysis, system designing, coding, testing and report writing.

Course Outcomes:	After the completion of the course the student will be able to -
CO1	Define appropriate problem statement for real world problems.
CO2	Organize an effective project plan with clear objectives and prepare a synopsis.
CO3	Design the various modules of the project to provide a solution to the problem with the help of various design tools.
CO4	Develop the proposed system using suitable development platform.Able to present their work and prepare technical project report.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3		1				1	1		3			
CO2	3	3		1	1	1	1	1	3	3	2	2	2	
CO3		1	2		2			1	3	2	3	3	3	3
CO4		1	2		2			1	3	3	2	3	3	2

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation (ISE)	50%	Problem identification and Design
2	End Semester Examination (ESE)	50%	Coding, Testing and Creating Repository

Course Contents:

1. The Project should be undertaken preferably by a group of 3-4 students.
2. These students will jointly work and implement the project.
3. The group will select a project with the approval from the domain expert panel and submit the name of the project with a synopsis.
4. The Project should consist of defining the problem and analyzing it, designing the solution and implementing it using a suitable programming language.
5. Presentation and demonstration based on the above work is to be given by the group for ISE.
6. The work will be jointly assessed twice in a semester by an internal domain expert panel. No externally implemented projects work will be allowed. Student has to follow every project phase himself in a group.
7. Hard copy of project report of the work done is to be submitted along with the softcopy of the project during ESE.

Project topics may be selected from following domains:

a. Real world applications in Data Analytics
b. Probability and Statistics
c. Data Preprocessing
d. Web Page design
e. Web Scrapping
f. Healthcare Analytics
g. Analytics using modern tools & techniques.

Course Code:	23DSEU3V09
Course Name:	Environmental Studies

L	T	P	Credit
2			2

Course Prerequsites:

1. Understanding of Environmental Education course

Course Description:

The main objective of course is to create awareness among students regarding environmental issues and its impact on society. Knowledge regarding environmental components, its degradation and protection of environment is need for sustainable future ahead.

Course Outcomes: After the completion of the course the student will be able to -

CO1	Understand the scope and importance of Environmental awareness and Sustainable development
CO2	Understand various Environmental issues due to development
CO3	Understand various modes of Environmental management through technoly and legislation
CO4	Acquire problem solving attitude through actual field experience, reporting it in the form of Field project work

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1													
CO2														
CO3														
CO4														
CO5														

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents

Course Contents:

Unit 1	Our Environment	5 Hours
Introduction to Environment, Scope of Environmental studies, importance of environmental awareness, Concept of sustainability, Sustainable Development- history and Goals, environmental ethics, Sustainability ethics, Population growth of world and reduced health content of the environment		
Unit 2	**Development and Environmental Health**	**8 Hours**
Natural resources: Types(renewable and non-renewable), developmental benefits, Forest- Benefits, problems (Deforestation), Biodiversity-- importance, threats, conservation, Ecosystems- importance, problem associated with major ecosystems, ecological restoration, Air- Benefits, problems (Pollution, climate change), Water- Benefits, problems (Depletion, pollution), Soil/ Land- Benefits, problems (Degradation, loss of fertility, desertification), Mineral- Benefits, problems (Mining, over exploitation, depletion, pollution), Energy resources- Benefits, problems (depletion, energy crisis) **Urbanization and Environmental health:** Urban problems, Solid waste- Effects of MSW, Plastic waste, Hazardous waste, E- waste		
Unit 3	**Environmental Management**	**8 Hours**
Renewable energy technologies- current, new(Bio gas, Bio fuel, hydrogen, etc), Pollution abetment –5R, ZLD, carbon credit, bio remedies, Soil/ land reclamation, Sustainable agriculture, Concept of EIA, Environmental audit, ISO certification (ISO 14001), Role of CPCB and MPCB in Environmental protection of India, Emerging technologies for environmental management- GIS, Remote sensing, Smart bin, IoT integration, Waste-to-Energy Technologies, Recycling Automation, Advanced Data Analytics, Circular Economy Practices, Sustainable Packaging Solutions, Community Engagement and Education, Decentralized Waste Treatment, Zero-Waste Initiatives, Legislative and Regulatory Changes, Environmental legislation- Environmental Protection Act, Air Act, Water Act, Solid waste Management Act, Hazardous waste Management Rule, E- Waste (Management) Rules, 2022		
Unit 4	**Field Project Work**	**5 Hours**
Case studies based on site visit (Each candidate has to go for field visit and complete a project work on Environmental issues and probable solutions)		

Text Books:

1. Handbook of Environmental Studies by Dr. G. R. Parihar, Publisher: Satyam Publishers and Distributors (1 January 2013),ISBN-10 : 9382664408, ISBN-13 : 978-9382664406
2. Environmental Studies by Anubha Kaushik, New Age International Private Limited (1 January 2007), ISBN-10 : 8122422403, ISBN-13 : 978-8122422405
3. Introduction to Environmental Engineering and Science 3e, by Masters, Publisher : Pearson Education India; 3rd edition (1 January 2015), ISBN-10 : 9332549761, ISBN-13 : 978- 9332549760
4. Solid Waaste Management in dwveloping countries, by Bhide A. D. and Sundersen B. B.- Indian National Scientific Documentation Centre, New Delhi

Reference Books:

1. Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I &II, Environmental Media
2. Ecology And Environment Pb, by P. D. Sharma, Rastogi Publications (1 January 2011)

Course Code:	23DSEU3H10
Course Name:	Economics and Management for IT

L	T	P	Credit
2			2

Course Prerequsites:

Basic knowledge of computer

Course Description:

The course is intended to provide basic understanding of Economics and Management to engineering students with following aspects –
1. To impart knowledge, with respect to concepts of management information system.
2. To expose the students to the characteristic and applications of Decision Support Systems.
3. To help the students to understand different trends in current information system technology and also IT Tools & Techniques for Business operations.

Course Outcomes: After the completion of the course the student will be able to -

CO1	Explain the concepts of system development management life cycle.
CO2	Describe scope and objective of management information system.
CO3	Develop the decision making skills and practices.
CO4	Elaborate the different corporate case studies.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2										2	1	1	
CO2	2										2	1	1	
CO3	2										2	1	1	
CO4	2										2	1	1	

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	ESE	50 Marks	
2			

Course Contents:

Unit 1	**Management Information System**	**4 Hours**
Conceptual foundations of information systems; Information theory; Information resource management; Types of information systems; Systems development - Overview of systems and design; System development management life-cycle, designing for online and distributed environments; Implementation and control of project.		
Unit 2	**Scope and Objectives of MIS**	**6 Hours**
MIS meaning and role, MIS concepts, Management science structure, Information flow in management, MIS, for management support, Planning with MIS, control with MIS. Problem solving & decision making, Development of MIS, strategic & project planning for MIS.		
Unit 3	**Enhancing Management Decision Making**	**5 Hours**
Decision support systems (DSS) – understanding DSS, characteristics components, major DSS applications. Group decision support systems (GDSS), - elements, characteristics, how GDSS can enhance group decision - making? Executive support systems (ESS) – role of ESS in the organization, developing ESS, benefits of ESS.		
Unit 4	**Case Studies**	**6 Hours**
Web Publishing: types of websites, Web surfing, E- commerce, B2B, B2C, C2C, E-commerce security issues, Ethical issues.		

Text Books:

1. Management of Information systems, Gordon B. Davis & Margreth H. Olson, Pearson Edition

Reference Books:

1. MIS Concepts & Design by Robert C. Murdik. PHI 2nd Edition
2. Information system by H.F. & Abraham, S., Database System Concepts, McGraw Hill
3. Engineering Economics, R.Paneerselvam, PHI publication
4. Modern Economic Theory, By Dr. K. K. Dewett& M. H. Navalur, S. Chand Publications

D. Y. PATIL DEEMED TO BE UNIVERSITY
SCHOOL OF ENGINEERING AND MANAGEMENT
Teaching and Evaluation Scheme from Year 2023-24 (as per NEP-2020)
B. Tech. Data Science Engineering (SEMESTER- IV)

Sr. No.	Course Code	Course Type	Course Name	Teaching Scheme				Theory			Practical		Total Marks
				Credits	Contact Hrs			ISE	MSE	ESE	INT	OE/ PoE	
					L	P	T						
1	23DSEU4P01	PCC	Discrete Mathematical Structures	**3**	3	-	-	20	30	50	-	-	100
2	23DSEU4P02	PCC	Design and Analysis of Algorithms	**3**	3	-	-	20	30	50	-	-	100
3	23DSEU4P03	PCC	Programming Lab - II	**4**	2	4	-	-	-	-	50	50	100
4	23DSEU4M04	MDM-II	Data Analysis and Visualization	**2**	2	-	-	-	-	50	-	-	50
5	23DSEU4O05	OEC-II	Introduction to Data Engineering	**2**	2	-	-	-	-	50	-	-	50
6	23DSEU4A06	AEC	Soft Skill	**2**	-	4	-	-	-	-	25	50	75
7	23DSEU4N07	VSEC	Web Application Development - I	**2**	1	2	-	-	-	-	25	50	75
8	23DSEU4V08	VEC	Human Values and Ethics	**2**	2	-	-	-	-	50	-	-	50
9	23DSEU4H09	HSSM	Leveraging Technologies for Project Management and Startup Ventures	**2**	1	2	-	-	-	-	50	-	50
10	23DSEU4D10	AC	Liberal Learning	**-**	2*	-	-	-	-	-	50*	-	
11	23DSEU4D11	AC	Finishing School Training - IV	**-**	2*	-	-	-	-	-	50*	-	
			Total	**22**	**16**	**12**	**0**						650

Sr. No.	Course Code	Course Type	Course Name	Teaching Scheme				Theory			Practical		Total Marks
				Credits	L	P	T	ISE	MSE	ESE	INT	OE/PoE	
1	23DSEU4Z01	Honors	Fundamentals of Cyber Security	3	3	-	-	20	30	50	25	-	100
2	23DSEU4Z02	Honors	Fundamentals of Cyber Security Lab	1	-	2	-	-	-	-	25	-	25

Note: $ - Open & Distance Learning, * - Values are not included in total marks

Prof T. B. Patil

Course Code:	23DSEU4P01		L	T	P	Credit
Course Name:	Discrete Mathematical Structures		3			3

Course Prerequsites:

1. Mathematics - Probability theory, Set theory, functions

Course Description:

This Course consists of concepts of Discrete mathematical structures such as mathematical logic, Sets, relations, functions, lattices and Boolean algebra, combinatorics and graph theory.

Course Outcomes: After the completion of the course the student will be able to -

CO1	Explain the basic concepts of discrete mathematical structures
CO2	Demonstrate the applications of discrete structures in different fields of computer science.
CO3	Solve problems using the concepts of Discrete structures.
CO4	Apply the mathematical proofs and techniques to prove the theorems in computer science.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2				1									
CO2	2			1	2	1						1	1	
CO3	2	2	2	1	1									
CO4	2	1	1	1	1	1								

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents

Course Contents:

Unit 1	**Mathematical logic (Text book-1)**	**8 Hours**
1.1 Statements and Notations 1.2 Connectives , Statement formulas and truth tables, well formed formulas, Tautologies, Equivalence of formulas, Duality law, Tautological implications, functionally complete sets of connectives, other connectives 1.3 Normal and principal normal forms, completely parenthesized infix and polish notations 1.4 Theory of Inference for statement calculus – validity using truth table, rules of inference, consistency of Premises and indirect method of proof, Predicate calculus		
Unit 2	**Set theory (Text book-1)**	**8 Hours**
2.1 Basic concepts of set theory, Operations on sets, Ordered pairs, Cartesian Products 2.2 Representation of discrete structures 2.3 Relation and ordering - properties of binary relations in a set, Relation matrix and the graph of a relation, Partition and Covering of set, Equivalence relations, Recurrence relations, Composition of Binary relations,Partial ordering , POSET and Hasse diagram. 2.4 Functions – types, composition of functions, Inverse functions.		
Unit 3	**Algebraic systems (Text book-1)**	**5 Hours**
3.1 Algebraic systems, properties and examples 3.2 Semigroups and Monoids, properties and examples, Homomorphism of Semigroups and Monoids 3.3 Groups: Definition and examples, Subgroups and homomorphism		
Unit 4	**Lattices and Boolean algebra (Text book-1)**	**5 Hours**
4.1 Lattice as POSETs , definition , examples and properties 4.2 Lattice as algebraic systems, Special lattices 4.3 Boolean algebra definition and examples 4.4 Boolean functions		
Unit 5	**Permutations, Combinations and Probability theory (Text book-2)**	**7 Hours**
5.1 The Basics of Counting 5.2 The Pigeonhole Principle 5.3 Permutations and Combinations 5.4 Generalized Permutations and Combinations 5.5 Discrete Probability 5.6 Conditional probability 5.7 Bayes' Theorem		
Unit 6	**Graphs (Text book-2)**	**7 Hours**
6.1 Introduction to Graphs 6.2 Graph Terminology 6.3 Representing Graphs and Graph Isomorphism 6.4 Connectivity 6.5 Euler and Hamilton Paths 6.6 Planar Graphs 6.7 Introduction to Trees		

Text Books:

1. Discrete Mathematical Structures with Application to Computer Science - J. P. Tremblay & R. Manohar (MGH International)
2. Discrete Mathematics and its Applications - Kenneth H. Rosen (AT&T Bell Labs) (mhhe.com/rosen)

Reference Books:

1. Discrete Mathematics - SemyourLipschutz, MarcLipson (MGH), Schaum's outlines.
2. C. L. Liu and D. P. Mohapatra, "Elements of Discrete Mathematics", SiE Edition, TataMcGrawHill, 2008,ISBN 10:0-07-066913-9
3. Schaums Solved Problem Series – Lipschutz.
4. Discrete Mathematical Structures – Bernard Kolman, Robert Busby, S.C.Ross and NadeemurRehman (Pearson Education)

Course Code:	23DSEU4P02
Course Name:	Design and Analysis of Algorithms

L	T	P	Credits
3			3

Course Prerequsites:

1. Problem Solving Approch
2. Data Structures

Course Description:

This course introduces basic methods for the design and analysis of efficient algorithms. Different algorithms for a given computational task are presented and their relative merits evaluated based on performance measures. It introduces the fundamental techniques for designing and analyzing algorithms, including asymptotic analysis, divide-and-conquer algorithms, greedy algorithms, dynamic programming, traversal methods and even backtracking approach. It also provides introduction to NP-completeness.

Course Outcomes: After the completion of the course the student will be able to -

CO1	demonstrate an understanding of algorithms, their properties, and design techniques.
CO2	evaluate algorithm performance using asymptotic notations.
CO3	select the most appropriate algorithmic strategy for solving complex computational problems.
CO4	classify problems into polynomial, NP-Hard, and NP-Complete categories.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1				1			1					1	
CO2	2	1		1				1		1	1			
CO3		2	2	1	1					1		2	1	1
CO4	1	1		1						1	1	2		

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	In Semester Evaluation 1 (ISE1)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	Mid Semester Examination (MSE)	30%	50% of course contents
3	In Semester Evaluation 2 (ISE2)	10%	Assignment, Test, Quiz, Seminar, Presentation, etc.
4	End Semester Examination (ESE)	50%	100% course contents

Course Contents:

Unit 1	**Introduction to Algorithms**	**7 Hours**
Definition, Properties of Algorithms, Expressing Algorithm- Pseudocode; Flowchart, Algorithm Design Techniques, Performance Analysis of Algorithms, Types of Algorithm's Analysis, Order of Growth, Asymptotic Notations, Recursion		
Unit 2	**Divide and Conquer**	**7 Hours**
The general method, Binary search, Finding the maximum and minimum, Merge sort, Quick sort, Analysis of Divide and Conquer algorithms.		
Unit 3	**Greedy Algorithms**	**7 Hours**
Introduction to Greedy Technique, General Greedy Method, Knapsack Problem, Job Sequencing with Deadline, Optimal Merge Patterns, Minimum Spanning Tree - Prim's Algorithm, Kruskal's algorithm, Single-Source Shortest Path Algorithm		
Unit 4	**Dynamic Programming**	**7 Hours**
The general method, Longest Common Sub-sequence, Bellman Ford, All pair shortest paths, 0/1 knapsack, Traveling Salesperson problem.		
Unit 5	**Backtracking**	**7 Hours**
Backtracking Concept, N–Queens Problem, Sum of Subsets Problem, Graph Coloring Problem, Hamiltonian Cycle		
Unit 6	**NP Hard and NP Complete Problems**	**6 Hours**
Introduction, Polynomial Complexity Class, Non Polynomial Complexity Class- NP-Hard, NP-Complete		

Text Books:

1. Ellis Horowitz, Satraj Sahani, Saguthevar Rajasejaran, Fundamentals of Computer Algorithms Universities Press, Second Edition (All Units)

Reference Books:

1. Gilles Brassard, Paul Bratley, Fundamentals of Algorithmics, Pearson Education
2. Kyle Loudon, Mastering Algorithms with C, SPD O'Reilly
3. Allen Van Gelder , Sara Baase, Computer Algorithms- Introduction to Design and Analysis, Pearson Education

Course Code:	23DSEU4P03
Course Name:	Programming Lab - II

L	T	P	Credit
2		4	4

Course Prerequsites:

Programming Language, Data Structures

Course Description:

Python is a high-level programming language which is used for developing a wide range of applications in different domains. It has a strong community around machine learning, data modeling, data analysis and artificial intelligence (AI), with extensive resources and libraries built for the same purpose.

Course Outcomes: After the completion of the course the student will be able to -

CO1	Study basic concept of python and Demonstrate use of decision and repetition structure in order to solve specific problem
CO2	Model a given big problem statement in to smaller parts to provide modular approach.
CO3	Demonstate object oriented concept in problem solving.
CO4	Choose proper data structure like list, touples, dictionaries etc. for solving given problem

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1				1			1				1		
CO2	1	1			1			1				1		
CO3	1	1	1		1			1				2		
CO4	1	1	1		1			1				2		

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	INT	50%	
2	POE	50%	

D Y PATIL EDUCATION SOCIETY KOLHAPUR Kasba Bawada, Kolhapur

Course Contents:

Unit 1	**Getting Started with Python**	**4 Hours**

What is Python?, What can Python do?, Why python?, Features, Python installation and Working of it, Advantages, Applications, Python Code Execution, Variables, Namespaces, Statement, Indentation,
Comments, Input and Output, Python blocks, Control statements, Branching statements.

Unit 2	**Array, Function, Modules & Packages**	**5 Hours**

Array: When to use array, how to use array, defining array, length of array, array indexing, searching in array, loop through array, array slice, operations on array
Functions: Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Scope and Lifetime of Variables in a Function, Anonymous / Lambda function, map() function, reduce() function, filter() function,
Modules: Creating modules, import/export modules
Packages: Introduction to PIP, Installing Packages via PIP, Using Python Packages

Unit 3	**Data types in Python**	**4 Hours**

String: Creating string, accessing elements of string, string length, concatenation, String formatting operator, built-in string methods and function, slice operation.
List: Creating list, access and update values in lists, nested and cloning lists, basic list operations, List methods, list comprehensions, looping in lists.
Tuple: Creating tuple, accessing values in a tuple, updating tuple, deleting elements in tuple, basic tuple operations
Dictionary: Creating a dictionary, accessing values, add, modify, delete, sort items in a dictionary, looping over a dictionary
Set: Creating a Set and set operations

Unit 4	**Object Oriented Programming using Python**	**5 Hours**

Procedural and Object-Oriented Programming, Objects, class, Method overloading, Polymorphism, Inheritance

Unit 5	**File Handling & Exception Handling**	**5 Hours**

File Handling: Files and File Paths, The os.path Module, The File Reading/Writing Process, shutil Module, Directories, Compressing Files with the zipfile Module
Regular Expression: Finding Patterns of Text without Regular Expressions, Finding Patterns of Text with Regular Expressions, More Pattern Matching with Regular Expressions, match(), search(), findall() function.
Exception Handling: What is Exception?, Handling an exception, try….except…else, try-finally clause, Argument of an Exception, Python Standard Exceptions, Raising an exceptions, User-Defined Exceptions

Unit 6	**Python Libraries - Numpy, Pandas, Matplotlib**	**5 Hours**

Numpy: Introduction to numpy, creating arrays, Using arrays and Scalars, Indexing Arrays, Array Transposition, Universal Array Function, Array Processing, Array Input and Output.
Pandas: What is pandas?, Where it is used?, Series in pandas, Index objects, Reindex, Drop Entry, Selecting Entries, Data Alignment, Rank and Sort, Summary Statics, Missing Data, Index Hierarchy.
Matplotlib: Simple Line Plots, Simple Scatter Plots, Visualizing Errors, Histogram.

Text Books:

1. Starting Out with Python 5th Tony Gaddis Pearson March 17th 2021
2. Beginning Python: Using Python 2.6 and Python 3.1., Wrox Publication
3. Anurag Gupta, G. P. Biswas, “Python Programming”, McGraw-Hill
4. E. Balagurusamy, “Introduction to computing and problem-solving using python”, McGraw Hill Education

Reference Books:

1. Learn Python the Hard Way, 3rd Edition, Zed Shaw's Hard Way Series
2. Laura Cassell, Alan Gauld, “Python Projects”, Wrox Publication

Experiment List

1 To study the installation of Python.
2 Write a program to implement control and branching statements.
3 Write a program to create and manipulate arrays.
4 Write a program to create and use functions.
5 Write a program to create anonymous functions and make use of map(), reduce() & filter() functions.
6 Write a program to create and use the python modules.
7 Write a program to import modules and packages from standard libraries and third-party repositories.
8 Write a program to implement and manipulate string & lists.
9 Write a program to implement and manipulate tuples & dictionaries.
10 Write a program to perform different set operations.
11 Write a program to create classes and objects using python.
12 Write a program to implement inheritance and polymorphism.
13 Write a program to read from and write to text files.
14 Write a program to find the patterns in text file using regular expression
15 Write a program to implement the exception handling.
16 Write a program to implement array operations using Numpy.
17 Write a program to implement universal function in Numpy.
18 Write a program to implement different data operations in Pandas.
19 Write a program to implement different charts and graphs in Matplotlib.
20 Students are supposed to develop a mini project using all features of python programming.

Course Code:	23DSEU4M04
Course Name:	Data Analysis and Visualization

L	T	P	Credit
2			2

Course Prerequsites:

1. Fundamentals of Data Science

Course Description:

This course introduces students to data analysis and visualization in the field of exploratory data science.

Course Outcomes: After the completion of the course the student will be able to -

CO1	Use data analysis tools in the pandas library.
CO2	Load, clean, transform, merge and reshape data and Handle external files as well as exceptions.
CO3	Solve real world data analysis problems.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2			1					1		2	1	
CO2	2	2			2				1	2				
CO3	1	1	2	1	3							1		2

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	End Semester Examination (ESE) [50 marks]	100%	100% course contents

Course Contents:

Unit 1	**Introduction**	**6 Hours**
Introduction to Data Science, Exploratory Data Analysis and Data Science Process. Motivation for using Python for Data Analysis, Introduction of Python shell iPython and Jupyter Notebook. Essential Python Libraries: NumPy, pandas, matplotlib, SciPy, scikit-learn, statsmodels.		
Unit 2	**Getting Started with Pandas**	**8 Hours**
Arrays and vectorized conputation, Introduction to pandas Data Structures, Essential Functionality, Summarizing and Computing Descriptive Statistics. Data Loading, Storage and File Formats. Reading and Writing Data in Text Format, Web Scraping, Binary Data Formats, Interacting with Web APIs, Interacting with Databases Data Cleaning and Preparation. Handling Missing Data, Data Transformation, String Manipulation		
Unit 3	**Data Wrangling and Data Visualization**	**8 Hours**
Data Wrangling: Hierarchical Indexing, Combining and Merging Data Sets Reshaping and Pivoting. Data Visualization matplotlib: Basics of matplotlib, plotting with pandas and seaborn, other python visualization tools.		
Unit 4	**Data Aggregation and Group operations**	**6 Hours**
Group by Mechanics, Data aggregation, General split-apply-combine, Pivot tables and cross tabulation, Categorical Data, Advanced GroupBy Use, Techniques for Method Chaining.		

Text Books:

1.McKinney, W.(2017). Python for Data Analysis: Data Wrangling with Pandas, NumPy and IPython. 2nd edition. O' Reilly Media

Reference Books:

1. O'Neil, C., & Schutt, R. (2013). Doing Data Science: Straight Talk from the Frontline O'Reilly Media

Course Code:	23DSEU4O05
Course Name:	Introduction to Data Engineering

L	T	P	Credit
2			2

Course Prerequsites:

Fundamental of Data Science

Course Description:

This course is about the understanding of fundamental techniques involved in the data engineering and will provide understanding of data engineering life cycle. Also, includes topics which focus on source systems of data engineering, storage, ingestion, Security, data Management, Data modelling and Design. They are used in a variety of applications today including Business Intelligence and Analytics, smart cities, healthcare, fraud detection

Course Outcomes: After the completion of the course the student will be able to -

CO1	Describe the basic principles, foundation and building blocks of Data Engineering.
CO2	Define the data engineering lifecycle and ETL model.
CO3	Explain the need of basic architecture in data engineering.
CO4	Summarize the technologies used for implementation of data engineering lifecycle

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1										1	
CO2	2	2	1										1	
CO3	2	2	1										1	
CO4	2	2	1										1	

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	End Semester Examination (ESE) [50 marks]	100%	100% course contents

Course Code:	23DSEU4A06
Course Name:	Soft Skill

L	T	P	Credit
		4	2

Course Prerequsites:

Basic English Knowledge

Course Description:

1. Soft skills are character traits and interpersonal skills that characterize a person's relationships with other people. This course includes Communication skills, Writing skills, Techniques for self- development, Teamwork and group discussions, Time and stress management, Professional skills for overalldevelopment of an Engineer.

Course Outcomes: After the completion of the course the student will be able to -

CO1	Effectively use the principles of communication.
CO2	Make appropriate use of interviews techniques.
CO3	Develop skills to conduct meetings & conferences.
CO4	Make effective presentations & technical report writing.
CO5	Actively participate in group discussion by following its etiquettes.
CO6	Effectively manage time and stress.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						1			3	3		3		
CO2									1	1		3		
CO3						1			3	1		3	2	
CO4	1				2	1			3	2		3	3	
CO5						1			2	2		3		
CO6						1			3	1		3	2	

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	INT [25 Marks]	33.33%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	End Semester Examination (ESE) [50 Marks]	66.67%	Oral Examination

Course Contents:	
Unit 1	**Communication Skills**
Process of communication, Flows of Communication in organization, Barriers to communication (Formal Flow – Upward, Downward, lateral and diagonal, Strategies to improve Organizational Communication,Effectiveness in Managerial Communication, and importance of technical communication, Nonverbal communication.	
Unit 2	**Interviews Skills**
Types of interview, General preparation for interview, gathering information about the company, knowing about the role/job position, Types of interviewing questions, Non-verbal communication to win the interview	
Unit 3	**Meeting & Conferences**
Planning a meeting (Agenda and notice), Conducting a meeting, Post meeting actions (Minutes), Planning & Conducting a Conference (anchoring and Report writing), and Video/web conferences, Identifying Strengths and Weakness.	
Unit 4	**Presentation Skills**
Effective Presentation strategies: Purpose, analyzing the audience and locale, organizing the content Oral presentation, Graphic presentation, Presentation aids, Personality Development. Newsletters, technical article and business letters. Technical Reports, characteristics, Importance, objectives, categories of report, format structure of reports, types of reports	
Unit 5	**Group Discussion**
Qualities needed for effective group discussion. Email etiquettes, Telephone Etiquettes, Role and responsibility of engineer, Work culture in jobs. Work place, rights and responsibilities.	
Unit 6	**Time and Stress Management**
Concept & Importance of Time Management, Techniques of Time Management, and Concept & Importance of Stress Management, Techniques of Stress Management, and Overcoming Stage fear and Interpersonal Relationships	

Text Books:

1. G.S.B.K Babu Rao, “Business Communication and Soft Skill”, Himalaya Publishing house (1st Edition)
2. Diane Hacker, “Pocket Style Manual”, Bedford Publication, New York, 2003. (ISBN 0312406843)
3. Shiv Khera, “You Can Win”, Macmillan Books, New York, 2003.

Reference Books:

1. Raman Sharma, “Technical Communications”, Oxford Publication, London, 2004.
2. “Ethics in Engineering practice and research” (2nd Edition) by Caroline Whit beck Cambridge
3. Sharma, R. and Mohan, K. “Business Correspondence and Report Writing”, TMH New Delhi 2002.

Course Contents:

Unit 1	**Foundation and Building Blocks of Data Engineering**	**6 Hours**
What is Data Engineering - Data Engineering Defined, Data Engineering Lifecycle, Evolution of the Data Engineer, Data Engineering and Data Science. Data Engineering Skills and Activities - Data Maturity and the Data Engineer, The Background and Skills of a Data Engineer, Business Responsibilities, Technical Responsibilities. Data Engineers Inside an Organization - Internal-Facing Versus External-Facing Data Engineers, Data Engineers and Other Technical Roles, Data Engineers and Business Leadership.		
Unit 2	**The Data Engineering Life Cycle**	**6 Hours**
What is data engineering life cycle - The data lifecycle vs the data engineering lifecycle, source systems,storage, ingestion, Batch vs streaming, push vs pull, Transformation, serving Data, Analytics, Machine Learning, Reverse ETL.Major undercurrents across the Data Engineering Lifecycle - Security, data Management, Data modelling and Design, Data Lineage, Data Integration and interoperability, Data Lifecycle management, DataOps		
Unit 3	**Designing good data architecture**	**6 Hours**
What is data architecture, enterprise architecture, Good data architecture, principles of good data architecture,Major architecture concepts, tight vs loose coupling, examples and types of Data architecture		
Unit 4	**Choosing technologies across Data Engineering Lifecycle**	**6 Hours**
Team size and capabilities, Speed to market, Interoperability, Cost optimization and business value, Today versus the future: immutable versus transitory technologies, Location (cloud, on premises, hybrid cloud, multi cloud), Build versus buy, Monolith versus modular, Serverless versus servers, Optimization, performance and the benchmark wars, The undercurrents of the data engineering lifecycle		

Text Books:

1. Fundamentals of Data Engineering, Joe Reis &Matt Housley, O'REILLY

Reference Books:

1. Designing Data-Intensive Applications, Martin Kleppmann, O'REILLY

Useful Links:

1.https://elearn.nptel.ac.in/shop/iit-workshops/completed/introduction-to-data-engineering-usingazure/?v=c86ee0d9d7ed

Course Code:	23DSEU4N07
Course Name:	Web Application Development – I

L	T	P	Credit
1		2	2

Course Prerequsites:

1. Basic Knowledge of Computer

Course Description:

This course is about the understanding and application development using the front end technologies. This aims to equip the students with different front end technologies needed to design and develop the applications of different problems related to UI interface

Course Outcomes: After the completion of the course the student will be able to -

CO1	Develop structured and styled web pages using HTML and CSS
CO2	Design responsive and user-friendly websites using Responsive Web Design principles
CO3	Implement dynamic and interactive web functionalities using JavaScript and jQuery

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1		2	1		1				1	2	
CO2	1	1	1		2	1		1				1	2	
CO3	1	1	2		2	1		1				1	2	

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	INT [25 Marks]	33.33%	Assignment, Test, Quiz, Seminar, Presentation, etc.
2	End Semester Examination (ESE) [50 Marks]	66.67%	100% course contents

Course Contents:

Unit 1	**HTML & CSS**	**3 Hours**

HTML: HTML Structure, Block Elements, Inline Elements, Class and ID Attributes, HTML Whitespaces.
CSS SELECTOR: Type, Class and ID Selector, Position and Group Selectors, Attribute Selectors, Pseudo-element Selectors, Pseudoclass Selectors.
Box Model: Display, Box Model, Inline Box, Inline-Block Box.

Unit 2	**Responsive Web Designing**	**3 Hours**

Responsive Web Designing: Introduction, Viewport, Grid View, Image, Video, Media Queries, RWD frameworks.
Twitter Bootstrap : Grid Basics, Typography, Tables, Images, Alerts, Button, Button Group, Borders, Labels, Progress bar, Pagination, Tabs, Navbar, Forms, Inputs, Input sizing, Carousel, Scrollspy.

Unit 3	**JavaScript**	**4 Hours**

Introduction, Data types and Variables, Operators, Expressions and Statements, Functions and Scope, Document Object Model, Event Handling, Form handling and validations.

Unit 4	**jQuery**	**3 Hours**

Introducing jQuery, jQuery selector, Animation effects, Event handling, DOM, jQuery DOM traversing, DOM manipulation.

Text Books:

1. Pro HTML5 and CSS3 Design Patterns by Michael Bowers, Dionysios Synodinos and Victor Sumner, Apress edition
2. Twitter Bootstrap Development How to by David Cochran, Packt Publication
3. JavaScript: The Definitive Guide by David Flanagan, O'Reilly Media
4. jQuery in Action by Bear Bibeault, Manning Publication

Reference Books:

1. Beginning with HTML5 and CSS3 The Web Evolved by Murphy, Apress
2. JavaScript: The Complete Reference by Thomas A Powell, Fritz Schneider, Tata McGraw Hill
3. Head First jQuery by Ryan Benedetti, O'reilly Publication

Experiment List:

1. Create Web Page structure using HTML5.

2. Create Web Pages with Class and ID attributes using HTML5.

3. Apply CSS to web pages created after developing the HTML5 pages.

4.Apply different CSS selectors to HTML5 web pages.

5. Create a responsive web page using media queries.

6. Create a responsive web page using bootstrap.

7. Write a JavaScript to compute mathematical operations on client side.

8. Write a JavaScript to handle event generated by client.

9. Write a JavaScript to perform form validation.

10. Write a jQuery script to provide animations effects in web pages.

11. Write a jQuery script to handle event generated by client.

12. Write a jQuery script to manipulate DOM

Course Code:	23DSEU4V08
Course Name:	Human Values & Ethics

L	T	P	Credit
2			2

Course Prerequsites:

Nil

Course Description:

Course Description:
The methodology of this course is universally adaptable, involving a systematic and rational study of the human being vis-à-vis the rest of existence. It is free from any dogma or value prescriptions. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with and within the student himself/herself finally

Course Outcomes: After the completion of the course the student will be able to -

CO1	Understand the significance of value inputs in a classroom and start applying them in their life and profession.
CO2	Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
CO3	Understand the role of a human being in ensuring harmony in society and nature.
CO4	Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						1		3	2	2		2		
CO2						2		3	2	2		2		1
CO3						2	2	3	2	2		2		1
CO4						2	2	3		2		2		1
CO5														

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	End Semester Examination (ESE) [50 Marks]	100%	100% course contents

Course Contents:

Unit 1	**Introduction to Value Education**	**7 Hours**
Value Education - Definition, Concept and Need for Value Education. The Content and Process of Value Education - Basic Guidelines for Value Education, Self-exploration as a means of Value Education, Happiness and Prosperity as parts of Value Education.		
Unit 2	**Harmony in the Human Being**	**5 Hours**
Human Being is more than just the Body. Harmony of the Self ('I') with the Body. Understanding Myself as Co-existence of the Self and the Body. Understanding Needs of the Self and the needs of the Body. Understanding the activities in the Self and the activities in the Body.		
Unit 3	**Harmony in the Family, Society and in the Nature**	**7 Hours**
Family as a basic unit of Human Interaction and Values in Relationships. The Basics for Respect and today's Crisis: Affection, e, Guidance, Reverence, Glory, Gratitude and Love. Comprehensive Human Goal: The Five Dimensions of Human Endeavour. Harmony in Nature: The Four Orders in Nature. The Holistic Perception of Harmony in Existence.		
Unit 4	**Social & Professional Ethics**	**7 Hours**
The Basics for Ethical Human Conduct. Defects in Ethical Human Conduct. Holistic Alternative and Universal Order. Universal Human Order and Ethical Conduct. Human Rights violation and Social Disparities.Value based Life and Profession. Professional Ethics and Right Understanding. Competence in Professional Ethics. Issues in Professional Ethics – The Current Scenario. Vision for Holistic Technologies, Production System and Management Models		

Text Books:

1. A.N.Tripathy, New Age International Publishers, 2003.
2. Bajpai. B. L , , New Royal Book Co, Lucknow, Reprinted, 2004
3. Bertrand Russell Human Society in Ethics & Politics

Reference Books:

1. Corliss Lamont, Philosophy of Humanism
2. Gaur. R.R. ,Sangal. R, Bagaria. G.P, A Foundation Course in Value Education, Excel Books, 2009
3. Gaur. R.R. ,Sangal. R ,Bagaria. G.P, Teachers Manual Excel Books, 2009.
4. I.C. Sharma . Ethical Philosophy of India Nagin& co Julundhar
5. Mortimer. J. Adler, – Whatman has made of man
6. William Lilly Introduction to Ethic Allied Publisher

Course Code:	23DSEU4H09	L	T	P	Credit
Course Name:	Leveraging Technology in Project Management and Start-up ventures	1		2	2

Course Prerequsites:
Software Engineering, project Management Basic Concepts.

Course Description:
This course explores the integration of technology with project management principles, emphasizing how computer engineering students can leverage advanced tools and strategies in managing projects and launching start-up ventures. The course covers project management methodologies, software tools, and real-world applications .

Course Outcomes:	After the completion of the course the student will be able to -
CO1	Apply technology to optimize project planning, execution, and monitoring.
CO2	Dmonstrate practical skills in using project management tools and technologies.
CO3	Learn the use of technology in start-up ventures and entrepreneurial projects.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1			1		1						2			
CO2			1		3		3		2	2	2	2	3	
CO3			1		3		3		2	3	2	2	3	

Assessment Scheme:

SN	Assessment	Weightage	Remark
1	Internal	100%	Assignment, Test, Quiz, Seminar, Presentation, etc.

Course Contents:		
Unit 1	**Introduction**	**3 Hours**
Project Management (PM) Fundamentals, People, Process, and Product, Technology Classic mistakes, PMI Processes, Software project phases, Organizational structures, Project charter, Statement of Work **(SOW)**		
Unit 2	**Project Management Methodologies**	**3 Hours**
Development lifecycle models, Project plans Work Breakdown Structures (WBS), Agile and Scrum: Principles and Practices,Comparing Methodologies: When to Use Which.		
Unit 3	**Project Planning and Scheduling Tools**	**3 Hours**
Introduction to Project Planning Software (e.g., MS Project, Jira, Asana), Creating Project Plans and Gantt Charts, Resource Allocation and Budgeting.		
Unit 4	**Vision and the Business Model & Innovation Strategies**	**4 Hours**
The Vision, The Mission Statement,The Value Proposition, The Business Model, Business Model Innovation in Challenging Markets, Core Competencies, Sustainable Competitive Advantage.First Movers Versus Followers, Imitation,Creativity and Invention, Types and Sources of Innovation, Technology and Innovation Strategy, New Technology Ventures.		

Text Books:

1. Information Technology Project Management, Kathy Schwalbe, Cengage Learning, 7/e, 2013.
2. Technology Ventures From Idea to Enterprise,Thomas H. Byers, Richard C. Dorf, Andrew J. Nelson

Reference Books:

1. Software Project Management by M. Cottrell and B. Hughes, McGraw-Hill, 5/e, 2009.
2. Project Management Software Tools: A Guide to Choosing the Right Tools by Michael S. Dobson
3. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses by Eric Ries.