



HINDI SEVA MANDAL'S (ESTD. 1950)
SHRI SANT GADGE BABA
COLLEGE OF ENGINEERING & TECHNOLOGY
BHUSAWAL - 425 203, DIST. JALGAON(M.S.)

A* Accredited by NAAC, Government of India

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Ref. No. SSGBCOET/2025-2026/ 422

Date : 04/05/2026

Notification

It is hereby noticed that the syllabus for S. Y. B.Tech. Computer Science & Engineering (Data Science) has been officially approved. The new curriculum was recommended by the Board of Studies on April 18, 2026, and approved by the Academic Council on April 25, 2026.

The approved syllabus shall be implemented from 2026-2027 academic year to all concerned semesters for S. Y. B.Tech. Computer Science & Engineering (Data Science) students.

All Head of Department, faculty, and students are hereby informed to take note of same and implement the Syllabus accordingly.

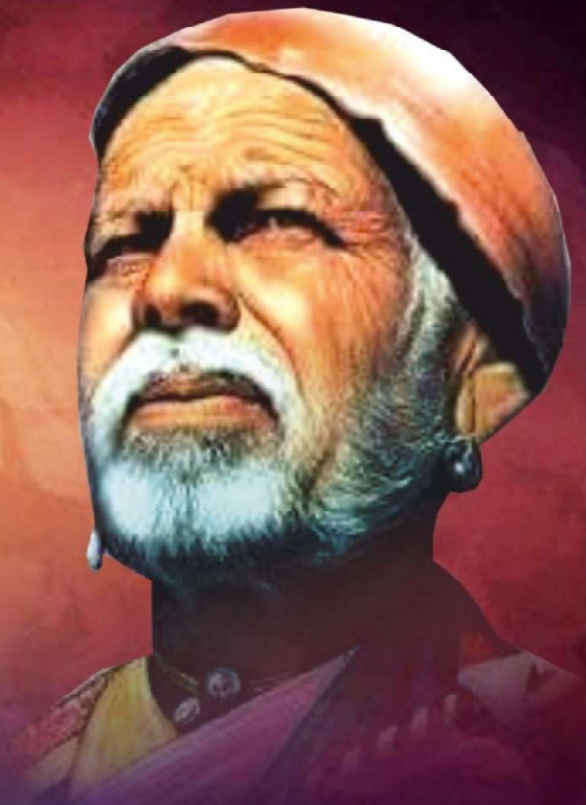
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Chairman & Head
BoS, Computer Science & Engg.

Dr.G.A.Kulkarni
Member Secretary
Academic Council

Prof.Dr.R.B.Barjibhe
Principal
Chairman Academic Council

“
Great saintly reformist who strived
for the material as well as
spiritual upliftment of the poor and
to eliminate superstition, illiteracy
and unsanitary conditions
”

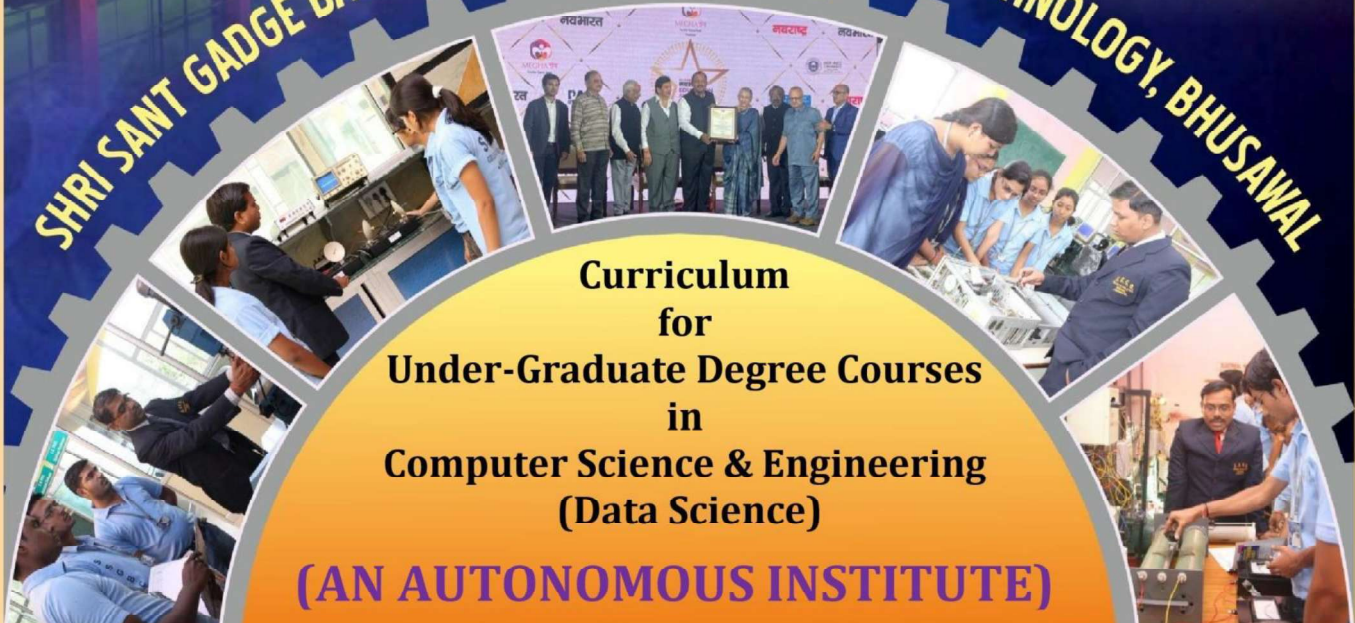
- Shri Sant Gadgebaba



SHRI SANT GADGE BABA COLLEGE OF ENGINEERING & TECHNOLOGY, BHUSAWAL

Curriculum
for
Under-Graduate Degree Courses
in
Computer Science & Engineering
(Data Science)

(AN AUTONOMOUS INSTITUTE)



Second Year Structure 2025-26 as per NEP 2020 w.e.f. 2026-27

Semester III											
Course Category	Category under NEP	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				No. of Credits
				L	T	P	CA	MSE	ESE	Total	
PCC	Programme Core Course	BTDS25PC301	Discrete Mathematics	3	--	--	20	20	60	100	3
PCC	Programme Core Course	BTDS25PC302	Data Structure and Algorithms	3	--	--	20	20	60	100	3
PCC	Programme Core Course	BTDS25PC303	Java Programming	2	--	--	20	20	60	100	2
MDM	Multidisciplinary Minor Bucket	BTDS25MD304	MDM-1**	3	--	--	20	20	60	100	3
OE	Open Elective Bucket	BTDS25OE305	A: Business Communication and intelligence B: Engineering Economics C: Digital Marketing Fundamentals D: Introduction to Data Science	3	--	--	20	20	60	100	3
PCC	Programme Core Course Lab	BTDS25PC306L	Data Structure Laboratory	--	--	2	50	--	50	100	1
PCC	Programme Core Course Lab	BTDS25PC307L	Java Programming Laboratory	--	--	2	50	--	50	100	1
OE	Open Elective	BTDS25OE308L	Open Elective Lab	--	--	2	50	--	50	100	1
HSSM	Entrepreneurship	BTDS25HM309	Case Study/EDP Programme/ Start Up Activity	--	--	4	50	--	--	50	2
HSSM	Value Education Course	BTDS25VEC310	Basic Human Rights	1	--	--	50	--	--	50	1
VEC	Value Education Course	BTDS25VEC311	Indian Constitution- Value Education	1	--	0	50	--	--	50	1
CEP	Community Engg.Project	BTDS25CEP312	Field Visit/Special Study/ Internship/ Social Activity Project/ Community Initiative	--	--	4	50	--	0	50	2
Total				16	--	14	450	100	450	1000	23
MDM-1** : The students will have to choose the MDM course being provided by other disciplines / offered at the college											

Second Year Structure 2025-26 as per NEP 2020 w.e.f. 2026-27**Semester IV**

Course Category	Category under NEP	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				No. of Credits
				L	T	P	CA	MSE	ESE	Total	
PCC	Programme Core Course	BTDS25PC401	Computer Organization & Architecture	3	--	--	20	20	60	100	3
PCC	Programme Core Course	BTDS25PC402	Analysis and Design of Algorithms	3	--	--	20	20	60	100	3
PCC	Programme Core Course	BTDS25PC403	Digital Electronics and Logic Design	2	--	--	20	20	60	100	2
MDM	Multidisciplinary Minor Bucket	BTDS25MD404	MDM-2**	3	--	--	20	20	60	100	3
OD	Open Elective Bucket	BTDS25OE405	A: Introduction to Financial Accounting B: Probability & Statistics C: Introduction to Robotics D: Introduction to Quantum Computing	2	--	--	20	20	60	100	2
(AEC)	Programme Core Course Lab	BTDS25AE406L	Analysis and Design of Algorithms Laboratory	--	--	2	50	--	50	100	1
(AEC)	Programme Core Course Lab	BTDS25AE407L	Digital Electronics and Logic Design Laboratory	--	--	2	50	--	50	100	1
(VSEC)	Open Elective Course Lab	BTDS25AE408L	Open Elective Lab	--	--	2	50	--	50	100	1
(VSEC)	Vocational & Skill Enhancement Course	BTDS25VSE409	Workshop / Skill Activity/ Course / Seminar	--	--	2	50	--	--	50	1
VEC	Value Education Course	BTDS25HM410	Universal Human Values-II	3	-	--	20	20	60	100	3
EN	Entrepreneurship	BTDS25HM411	Mini Project/ Case Study / EDP Programme / Start Up Activity	--	--	4	50	--	--	50	2
VEC	Value Education Course	BTDS25VEC412	Life of Shri Sant Gadge Baba	1	--	--	--	--	--	--	AU
VEC	Value Education Course	BTDS25VEC413	Moral and Ethical Development	1	--	--	50	--	--	50	1
Total				18	--	12	420	120	510	1050	23

MDM-2 : The students will have to choose the MDM course being provided by other disciplines / offered at the college**

SUBJECT CODE BTDS25PC301	SUBJECT Discrete Mathematics	CREDITS 3
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Teaching Scheme	Examination Scheme
Theory: 3 Hrs. / Week Tutorial : Practical:	Continuous Assessment: 20 Marks Mid-Semester Exam: 20 Marks End Semester Exam: 60 Marks

Course Objectives:-

1	Understand fundamentals of logic, sets, and relations.
2	Develop skills in constructing mathematical proofs.
3	Learn combinatorial techniques for counting problems.
4	Understand recurrence relations and sequences.
5	Apply graph theory concepts in computing.

Course Outcomes:-

C01	Understand and construct precise mathematical proofs
C02	Apply logic and set theory to formulate precise statements
C03	Analyze and solve counting problems on finite and discrete structures
C04	Describe and manipulate sequences
C05	Apply graph theory in solving computing problems

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes (3/2/1 indicates strength of correlation)											
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	3	--	2	--	--	--	--	--	--	--	--
C02	3	3	--	--	--	--	--	1	--	--	--	--
C03	3	2	2	--	--	--	--	--	--	--	--	--
C04	2	2	--	--	--	--	--	--	--	--	--	--
C05	3	--	2	--	2	--	--	--	1	--	--	--

COURSE CONTENTS**UNIT-I****[09 Hours]**

Mathematical Logic: Statements and notations, Connectives, Well formed formulas, Truth Tables, tautology, equivalence implication, Normal forms, Quantifiers, universal quantifiers.

Predicates: Predicative logic, Free & Bound variables, Rules of inference.

UNIT-II**[09 Hours]**

Sets: Introduction, Combination of sets, finite and infinite sets, uncountably infinite sets, mathematical induction, principle of inclusion, exclusion.

Permutations and Combinations: Rules of sum and product, permutations, combinations, its generation

UNIT-III**[08 Hours]**

Relations: Definition, properties of binary relations, equivalence relations and partitions, partial ordering relations, lattice, chains, antichains.

Functions: Definition, pigeon hole principles and its application, propositions and its calculus.

UNIT-IV**[07 Hours]**

Graph Theory: Basic Terminology, multigraph, weighted graphs, paths, circuits, Hamilton and Eulerian Paths and circuits, Factors of graph, Planner Graph.

UNIT-V**[09 Hours]**

Trees and Cut Sets: Trees, Rooted Trees, Path lengths, prefix codes, Binary search trees, spanning trees, cut sets.

Algebraic structures: Algebraic systems Examples and general properties, Semi-groups and monoid, groups sub groups' homomorphism, Isomorphism.

TEXT BOOKS:

1. Elements of DISCRETE MATHEMATICS- A computer Oriented Approach- C L Liu, D P Mohapatra. Third Edition, Tata McGraw Hill.
2. Discrete Mathematics for Computer Scientists & Mathematicians, J.L. Mott, A. Kandel, T.P. Baker, PHI.

REFERENCE BOOKS:

1. Discrete Mathematics and its Applications, Kenneth H. Rosen, Fifth Edition. TMH.
2. Discrete Mathematical structures Theory and application- Malik & Sen, Cengage.
3. Discrete Mathematics with Applications, Thomas Koshy, Elsevier.
4. Logic and Discrete Mathematics, Grass Man & Trembley, Pearson Education.

SUBJECT CODE BTDS25PC302	SUBJECT Data Structure and Algorithms	CREDITS 3
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Teaching Scheme	Examination Scheme
Theory: 3 Hrs. / Week Tutorial : Practical:	Continuous Assessment: 20 Marks Mid-Semester Exam: 20 Marks End Semester Exam: 60 Marks

Course Objectives:-

1	Understand basic data structures and their operations.
2	Learn algorithm design and analysis techniques.
3	Study sorting and searching algorithms.
4	Implement linear and non-linear data structures.
5	Evaluate performance of algorithms.

Course Outcomes:-

CO1	Ability to select the data structures that efficiently model the information in a problem.
CO2	Ability to assess efficiency trade-offs among different data structure implementations or combinations.
CO3	Implement and know the application of algorithms for sorting .
CO4	Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, AVL-trees, heaps and graphs.
CO5	To understand concepts about searching and sorting techniques

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes (3/2/1 indicates strength of correlation)											
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	3	--	--	2	--	--	--	--	--	--	--
C02	--	3	--	2	--	--	--	--	--	--	--	--
C03	3	--	2	--	3	--	--	--	--	--	--	--
C04	--	--	3	--	3	--	--	--	--	--	2	--
C05	--	3	--	2	--	--	--	--	--	--	--	--

COURSE CONTENTS**UNIT-I****[09 Hours]**

Introduction: Data, Data types, Data structure, Classification of Data Structure, Abstract Data Type (ADT), representation of Information, Characteristics of algorithm, program, analyzing programs.

Arrays and Hash Tables: Concept of sequential organization, linear and non-linear data structures, storage representation, array processing. Hash Tables, Hash functions, Collision Resolution Techniques.

UNIT-II**[09 Hours]**

Stacks and Queues: Introduction, stack and queue as ADT, representation and implementation of stack and queue using sequential and linked allocation, Circular queue and its implementation, Application of stack for expression evaluation and expression conversion, Recursion, Double Ended Queue, Priority queue.

UNIT-III**[09 Hours]**

Linked Lists: Concept of linked organization, singly and doubly linked list, and dynamic storage management, Storage Pool, Dynamic Memory Management, Garbage Collection. Circular linked list, operations such as insertion, deletion, concatenation and traversal.

UNIT-IV**[09 Hours]**

Trees: Introduction, Basic Tree terminology. Representation in Memory. Tree Traversals.

Binary Tree: Concept and Operations.

Binary Search Trees: Concept and Operations binary search tree and its traversal.

AVL Trees: Definition, Height of an AVL Tree, Operations – Insertion, Deletion and Searching AVL Tree.

UNIT-V**[08 Hours]**

Searching: Linear search algorithm and Binary search algorithm.

Sorting: Bubble Sort, Insertion sort, Selection sort, Merge Sort, Quick Sort, Radix sort.

TEXTBOOKS:

1. S. Lipschutz, Data Structures, McGraw-Hill Publication, Revised 1st Edition, 2014.
2. Vishal Goyal, Lalit Goyal, A Simplified Approach to Data Structure, SPD Publication, 1st Edition, 2014.
3. Data Structures using C, G. S. Baluja.

REFERENCE BOOKS:

1. Horowitz and Sahani, Fundamentals of Data Structures, Universities Press, 2nd Edition, 2008.
2. Thomas Cormen, Introduction to Algorithms, PHI Publication, 2nd Edition, 2002.

SUBJECT CODE BTDS25PC303	SUBJECT Java Programming	CREDITS 2
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Teaching Scheme	Examination Scheme
Theory: 2 Hrs. / Week Tutorial : Practical:	Continuous Assessment: 20 Marks Mid-Semester Exam: 20 Marks End Semester Exam: 60 Marks

Course Objectives:-

1	Understand object-oriented programming concepts.
2	Learn Java syntax and programming constructs.
3	Develop programs using classes and objects.
4	Understand exception handling and multithreading.
5	Implement file handling and event-driven programming.

Course Outcomes:-

CO1	An understanding of the principles and practice of object oriented analysis and design in the construction of robust, maintainable programs which satisfy their requirements;
CO2	A competence to design, write, compile, test and execute straightforward programs using a high level language;
CO3	An appreciation of the principles of object oriented programming;
CO4	An awareness of the need for a professional approach to design and the importance of good documentation to the finished programs
CO5	Be able to implement, compile, test and run Java programs comprising more than one class, to address a particular software problem.

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes (3/2/1 indicates strength of correlation)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	3	2	--	--	--	--	--	--	--	--	--	--
C02	--	--	3	1	3	--	1	--	--	--	--	--
C03	3	--	2	--	--	1	--	--	--	--	1	--
C04	--	--	--	1	--	1	--	2	--	3	--	--
C05	--	--	3	--	3	--	--	--	2	--	--	1

COURSE CONTENTS**UNIT-I****[06 Hours]**

Java Programming- History of Java, comments, Data types, Variables, Constants, Scope and Lifetime of variables, Operators, Operator Hierarchy, Expressions, Type conversion and

casting, Enumerated types.

OOP Concepts:-Data abstraction, encapsulation, inheritance, Benefits of Inheritance, Polymorphism, classes and objects, Procedural and object oriented programming paradigms.

UNIT – II

[07 Hours]

Inheritance – Inheritance hierarchies super and sub classes, Member access rules, super keyword, preventing inheritance: final classes and methods.

Polymorphism – dynamic binding, method overriding, abstract classes and methods.

Interfaces- Interfaces Vs Abstract classes, defining an interface, implement interfaces, accessing implementations through interface references.

UNIT-III

[06 Hours]

Exception handling- Dealing with errors, benefits of exception handling, the classification of exceptions- exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw.

Multithreading – Differences between multiple processes and multiple threads, thread states, creating threads, interrupting threads.

UNIT-IV

[05 Hours]

Applets – Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets.

UNIT-V

[05 Hours]

Files- Streams- Byte streams, Character streams. Files- Streams- Byte streams, Character streams, random access file operations, File management using File class.

TEXT BOOK:

1. Java Fundamentals – A Comprehensive Introduction, Herbert Schildt and Dale Skrien, TMH.

REFERENCE BOOKS:

1. Java for Programmers, P.J.Deitel and H.M.Deitel, PEA (or) Java: How to Program , P.J.Deitel and H.M.Deitel, PHI
2. Object Oriented Programming through Java, P. Radha Krishna, Universities Press. Thinking in Java, Bruce Eckel, PE
3. Programming in Java, S. Malhotra and S. Choudhary, Oxford Universities Press

SUBJECT CODE BTDS25OE305(A)	SUBJECT Business Communication and Intelligence	CREDITS 3
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Teaching Scheme	Examination Scheme
Theory: 3 Hrs. / Week Tutorial : Practical:	Continuous Assessment: 20 Marks Mid-Semester Exam: 20 Marks End Semester Exam: 60 Marks

Course Objectives:-

1	Understand principles of communication.
2	Develop interpersonal communication skills.
3	Improve professional writing abilities.
4	Learn conflict management and negotiation.
5	Enhance presentation and teamwork skills.

Course Outcomes:-

C01	Recognize the need for life skills and values
C02	Identify own strengths and opportunities
C03	Recognize the importance of vocabulary enrichment
C04	Understand the basic tenets of communication and apply the basic communication practices in different types of communication
C05	Apply the life skills to different situations

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes (3/2/1 indicates strength of correlation)											
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	--	--	--	--	--	--	--	2	2	3	--	1
C02	--	--	--	--	--	--	--	--	3	3	--	1
C03	--	--	--	--	--	--	--	--	3	3	--	1
C04	--	--	--	--	--	2	--	2	2	3	--	1
C05	--	--	--	--	--	--	--	--	3	2	1	2

COURSE CONTENTS**UNIT-I****[07 Hours]**

Introduction, Definitions & Concepts, Communicative Competence.

UNIT-II**[08 Hours]**

Intercultural Communication, Nonverbal Communication, Thought and Speech, Translation as Problematic Discourse.

UNIT-III**[07 Hours]**

Barriers to Communication, Listening, Communication Rules, Communication Style.

UNIT-IV

[09 Hours]

Interpersonal Communication, Relational Communication, Organizational Communication. Collaboration, Communication in Groups and Teams, Persuasive Communication

UNIT-V

[09 Hours]

Negotiation and Conflict Management, Leadership, Written Communication in International Business, Role of Technology in international Business Communication, Moving to Another Culture, Crisis Communication, Ethics in Business Communication.

TEXT BOOKS:

1. Mary Ellen Guffey, Essentials of Business Communication, Sixth Edition, South- Western College Publishing

REFERENCE BOOKS:

1. Bovee, Courtland, John Thill & Mukesh Chaturvedi, Business Communication Today: Dorling kindersley, Delhi.
2. Kaul, Asha, Business Communication, Prentice-Hall of India, Delhi.
3. Monippally, Matthukutty M. Business Communication Strategies. Tata McGraw-Hill Publishing Company Ltd., New Delhi.
4. Sharma, Sangeeta and Binod Mishra, Communication Skills for Engineers and Scientists, PHI Learning Pvt. Ltd., New Delhi.

SUBJECT CODE BTDS250E305(B)	SUBJECT Engineering Economics	CREDITS 3
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Teaching Scheme	Examination Scheme
Theory: 3 Hrs. / Week Tutorial : Practical:	Continuous Assessment: 20 Marks Mid-Semester Exam: 20 Marks End Semester Exam: 60 Marks

Course Objectives:-

1	Understand economic principles in engineering.
2	Analyze demand and supply concepts.
3	Study cost and revenue analysis.
4	Learn time value of money concepts.
5	Evaluate engineering projects economically.

Course Outcomes:-

C01	Remembering: Define the basic concept of micro and macro economics, engineering economics and their application in engineering economy.
C02	Understanding : Evaluate numerically the effects of changes in demand and supply on price determination of products and services.
C03	Analyze : the macroeconomic environment and financial systems of the country and its impact on business, society and enterprise.
C04	Develop : the ability to account for time value of money using engineering economy factors and formulas.
C05	Apply: knowledge of mathematics, economics and engineering principles to solve engineering problems and to analyze decision alternatives in engineering projects considering upon depreciation, taxes and inflation.

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes (3/2/1 indicates strength of correlation)											
	3-Strong, 2-Medium, 1-Weak											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	2	2	--	--	--	--	--	--	--	--	3	1
C02	--	3	--	2	--	--	--	--	--	--	3	1
C03	--	--	3	--	--	--	--	--	--	--	3	1
C04	--	--	--	--	--	2	--	2	--	--	3	1
C05	--	--	--	--	--	--	--	--	--	--	2	3

COURSE CONTENTS**UNIT-I****[08 Hours]**

Engineering Economics- Nature, Scope, Basic problems of an economy, Micro Economics and Macro Economics.

Demand - Meaning of demand, Demand function, Law of Demand and its exceptions, Determinants of demand, Elasticity of demand & its measurement (Simple numerical problems

to be solved), Demand Forecasting Meaning

UNIT-II

[09 Hours]

Production - Production function, Laws of returns: Law of variable proportion, Law of returns to scale

Cost and Revenue Concepts - Total Costs, Fixed cost, Variable cost, Total revenue, Average revenue and Marginal revenue, Cost-Output Relationships in the Short Run, and Cost-Output Relationships in the Long Run, Analysis of cost minimization.

UNIT-III

[08 Hours]

Market - Basic understanding of different market structures, Determination of equilibrium price under perfect competition (Simple numerical problems to be solved), Break Even Analysis-linear approach (Simple numerical problems to be solved).

UNIT-IV

[09 Hours]

Time Value of Money- Interest - Simple and compound, nominal and effective rate of interest, Cash flow diagrams, Principles of economic equivalence.

Evaluation of Engineering Projects -Present worth method, Future worth method, Annual worth method, Internal rate of return method, Cost benefit analysis for public projects.

Depreciation- Depreciation of capital asset, Causes of depreciation, Methods of calculating depreciation - Straight line method, Declining balance method, SOYD method, After tax comparison of project

UNIT-V

[08 Hours]

Inflation-Meaning of inflation, types, causes, measures to control inflation.

National Income-Definition, Concepts of national income, Method of measuring national income.

Banking -Commercial bank. Functions of commercial bank, Central bank, Functions of Central Bank.

TEXT BOOKS:

1. Principles of Economics by Deviga Vengedasalam and Karaunagaran Madhavan, Oxford
2. Riggs, Bedworth and Randhwa, "Engineering Economics", McGraw Hill Education India
3. C. S. Park, Contemporary Engineering Economics, 6th Edition, Pearson Education, 2015.
4. Engineering Economy by William G.Sullivan, Elin M.Wicks, C. Patric Koelling, Pearson
5. R.Paneer Seelvan, " Engineering Economics", PHI
6. Ahuja,H.L., "Principles of Micro Economics" , S.Chand & Company Ltd
7. Jhingan,M.L., "Macro Economic Theory"
8. Macro Economics by S.P.Gupta, TMH

REFERENCE BOOKS:

1. Donald G. Newnan, Jerome P. Lavelle & ted G. Eschenbach, Engineering Economic Analysis, Engineering press, Austin, Texas.
2. Seema Singh, Economics for Engineering Students, IK International Publishing House Pvt. Ltd.

SUBJECT CODE BTDS250E305(C)	SUBJECT Digital Marketing Fundamentals	CREDITS 3
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Teaching Scheme	Examination Scheme
Theory: 3 Hrs. / Week Tutorial : Practical:	Continuous Assessment: 20 Marks Mid-Semester Exam: 20 Marks End Semester Exam: 60 Marks

Course Objectives:-

1	Understand digital marketing fundamentals.
2	Learn SEO and social media marketing.
3	Analyze consumer behavior online.
4	Study email and mobile marketing.
5	Use digital tools for marketing campaigns.

Course Outcomes:-

C01	Digital marketing concepts focus on promoting products and services using online platforms and digital technologies.
C02	In a globalized market, digital marketing helps businesses reach international audiences quickly and cost-effectively.
C03	The applications of digital marketing include social media marketing, search engine optimization, and online advertising.
C04	E-mail advertising is used to communicate directly with customers by sending promotional messages, updates, and offers.
C05	Mobile marketing allows businesses to reach consumers through smartphones using apps SMS, and mobile-friendly advertisements.

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes (3/2/1 indicates strength of correlation)											
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	--	2	--	--	3	--	--	--	1	3	--	1
C02	--	--	3	--	3	--	--	--	2	3	--	1
C03	--	--	--	2	3	--	--	--	1	3	--	1
C04	--	--	3	--	3	--	--	--	3	2	--	1
C05	--	--	--	--	2	--	--	--	2	2	2	3

COURSE CONTENTS**UNIT-I****[07 Hours]**

Introduction to Digital Marketing (DM)-Meaning, Definition, Need of DM, Scope of DM, History of DM, Concept and approaches to DM, Examples of good practices in DM.

UNIT-II**[09 Hours]**

Marketing Automation: Definition, Advantages, Marketing Automation Softwares: CRM, Sales force, Analytics; Customer Experience (CX), How does marketing automation help marketers, Marketing automation tools.

UNIT-III**[08 Hours]**

Digital Marketing Mix: Online Advertising, Lead Generation, Social Media Marketing, Content and Copywriting. Influencer Marketing: Influencer, Payment to Influencer, difference between influencer marketing and celebrity endorsements.

UNIT-IV**[08 Hours]**

Email Marketing- Need for Emails, Types of Emails, options in Email advertising, Features of Mail Chimp, Mobile Marketing: Overview of the B2B and B2C Mobile Marketing.

UNIT-V**[09 Hours]**

What are Blogs, Importance of Blogs, Personal Blogs, Corporate Blogs, Popular Blog Platforms, What are Tags, Widgets, Blog Optimization, and Blog Stats.

TEXT AND REFERENCE BOOKS:

1. Dave Evans., Susan Bratton, (2010). Social Media Marketing: The Next Generation of Business Engagement. Wiley
2. Your Google Game Plan for Success: Increasing Your Web
3. Michael J. Thibault (2023). The Influencer Blueprint: A Step-by-Step Guide to Harnessing the Power of Influencer Marketing for Business Success.
4. George Pain(2019). Marketing Automation and Online Marketing: Automate Your Business through Marketing Best Practices such as Email Marketing and Search Engine Optimization
5. Stevan Roberts (2016). Marketing AI: From Automation to Revenue Performance Marketing
6. Jodie the Mom (2023) Email Marketing Planner: Organize and Track Your Emails.

SUBJECT CODE BTDS250E305(D)	SUBJECT Introduction to Data Science	CREDITS 3
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Teaching Scheme	Examination Scheme
Theory: 3 Hrs. / Week Tutorial : Practical:	Continuous Assessment: 20 Marks Mid-Semester Exam: 20 Marks End Semester Exam: 60 Marks

Course Objectives:-

1	Understand data science concepts and tools.
2	Learn data preprocessing and visualization.
3	Study statistical analysis methods.
4	Understand machine learning basics.
5	Explore data-driven decision making.

Course Outcomes:-

C01	Describe what Data Science is and the skill sets needed to be a data scientist
C02	Explain the significance of exploratory data analysis (EDA) in data science
C03	Ability to learn the supervised learning, SVM
C04	Apply basic machine learning algorithms (Linear Regression)
C05	Explore the Networks, PageRank

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes (3/2/1 indicates strength of correlation)											
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	3	--	--	2	--	--	--	--	--	--	1
C02	--	3	--	3	3	--	--	--	--	--	--	1
C03	--	--	3	--	3	--	--	--	--	--	--	1
C04	--	--	--	3	3	--	--	--	--	2	--	1
C05	--	--	--	--	2	--	--	--	--	--	--	3

COURSE CONTENTS**Unit 1****[09 Hours]****Introduction to Data Science**

The Data Science Lifecycle, Evolution of Data Science: Growth & Innovation, Roles in Data Science, Stages in a data science project, Applications of data science in various fields, Data security issues, Data Security Vs Data Privacy, Data Security Risks, Common Data Security Solutions and Techniques.

Unit 2**[08 Hours]****Data Collection and Preprocessing**

DATA COLLECTION: Primary Data Collection Methods, Secondary Data Collection Methods, Data

preprocessing, key steps in data preprocessing, Data Preprocessing in Data Mining, Major Tasks in Data Preprocessing, Data Preprocessing in machine learning, Data cleaning, Steps of Data Cleaning, Methods of Data Cleaning, Process of Data Cleaning, Tools for Data Cleaning in Data Mining.

Unit 3

[08 Hours]

Descriptive Statistics

Types of Descriptive Statistics, Distribution (also called Frequency Distribution), Measures of Central Tendency, Variability (also called Dispersion), Skewness: Types of Skewness, Calculate the skewness coefficient of the sample, Kurtosis: Excess Kurtosis, Types of excess kurtosis, Box plot, Range: Interquartile Range(IQR). Pivot table, Wide vs. Long Data, Aggregation Functions, Missing Data.

Unit 4

[09 Hours]

Model Development

Regression Analysis, Simple Linear Regression, Multiple Linear Regression, Multiple regression in machine learning, MLR equation, Model evaluation using visualization, Residual Plot and its Analysis, Characteristics of Good Residual Plots, Polynomial Regression, Types of Polynomial Regression, Assumption of Polynomial Regression, Linear Regression Vs Polynomial Regression, Non-linear data in Polynomial Regression.

Unit 5

[08 Hours]

Model Evaluation

Generalization Error, Evaluation Metrics, Confusion Matrix, Type I Error: - equivalent to False Positives(FP), Type II Error: - equivalent to False Negatives(FN)., CROSS VALIDATION: K-Fold Cross Validation, Overfitting and Underfitting: What is Overfitting? Ways to Tackle Overfitting, What is Underfitting? Ways to Tackle Underfitting.

Texts/References:

1. Chantal D. Larose, Daniel T. Larose, Fundamentals of Data Science Using Python and R, Wiley India Edition, 2014, ISBN: 9788126562159
2. Aviral Sharma, Chaitan Baru, Data Science for Dummies
3. CBSE Data Science Student Handbook, Central Board of Secondary Education (CBSE)
4. Authors: Shalini Harisukh, Anjna Virmani, V.K. Jain, Data Science, Orange Education Pvt Ltd, 2021
5. M.C. Srivastava, Rajiv Saxena, Data Science: Concepts and Practice (Second Edition)
6. B. Uma Maheswari, Introduction to Data Science: Practical Approach with R and Python

SUBJECT CODE BTDS25PC306L	SUBJECT Data Structure Laboratory	CREDITS 1
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Teaching Scheme	Examination Scheme
Theory: Tutorial : Practical: 2 hrs/ week	Continuous Assessment: 50 Marks Mid-Semester Exam: End Semester Exam: 50 Marks

Course Objectives:-

1	Implement basic data structures.
2	Develop programs using stacks and queues.
3	Practice linked list operations.
4	Implement tree and graph algorithms.
5	Improve coding and debugging skills.

Course Outcomes:-

C01	Write programs for data structures.
C02	Implement stack and queue operations.
C03	Perform linked list manipulations.
C04	Execute tree and graph algorithms.
C05	Debug and optimize programs.

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes (3/2/1 indicates strength of correlation)											
	3-Strong, 2-Medium, 1-Weak											
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	--	--	--	3	--	--	--	--	--	--	--
C02	--	2	--	--	3	--	--	--	--	--	--	--
C03	--	--	2	--	3	--	--	--	--	--	--	--
C04	--	--	--	2	3	--	--	--	--	--	--	--
C05	--	2	--	--	--	--	--	--	--	--	--	2

List of Practical's to be performed**(At-least 08 experiments should be performed from the following list)**

1. Implementation of STACK using arrays.
2. Converting a given Infix Expression to Postfix form using STACK.
3. Implementation of Queue using arrays.
4. Implementation of Circular Queue using arrays.
5. Implementation of Double Ended Queue using arrays.
6. Implementation of Single linked list and various operations.
7. Implementation of Double linked list and various operations.
8. Implementation of Binary Tree and various operations
9. Implementation of Binary Search Tree and various operations

10. Implementation of AVL Tree and various rotation operations
11. Implementation of Linear Probing technique
12. Implementation of Bubble Sort Algorithm
13. Implementation of Insertion Sort Algorithm
14. Implementation of Merge sort Algorithm
15. Implementation of Quick Sort Algorithm

SUBJECT CODE BTDS25PC307L	SUBJECT Java Programming Laboratory	CREDITS 1
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Teaching Scheme	Examination Scheme
Theory: Tutorial : Practical: 2 hrs/ week	Continuous Assessment: 50 Marks Mid-Semester Exam: End Semester Exam: 50 Marks

Course Objectives:-

1	Fundamental Concepts: To learn and apply the basic principles of OOP, including classes, objects, data abstraction, and encapsulation.
2	Advanced OOP: To implement complex relationships through inheritance, interfaces, and polymorphism.
3	Error Management: To understand and implement Exception Handling mechanisms for building reliable software.
4	Application Building: To design graphical user interfaces (GUIs) using AWT or Swing components.
5	Concurrency & I/O: To explore multithreading and I/O streams for efficient data processing and file handling.

Course Outcomes:-

C01	Demonstrate the ability to write and debug Java programs using sequential, branching, and looping structures.
C02	Design and develop object-oriented systems by properly defining classes and objects
C03	Use inheritance and interfaces to create reusable and modular code.
C04	Implement exception handling and packages to manage real-world software complexities.
C05	Build Java applications that incorporate multithreading, file I/O, and collection frameworks.

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes (3/2/1 indicates strength of correlation)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	3	--	--	--	3	--	--	--	--	--	--	--
C02	--	--	3	--	3	--	--	--	--	--	--	--
C03	--	--	3	--	--	--	--	--	2	--	--	--
C04	--	--	--	--	3	--	--	--	--	2	--	--
C05	--	--	--	--	3	--	--	--	3	--	--	--

List of Practical's to be performed
(At-least 08 experiments should be performed from the following list)

1. Programs on Operators, Arithmetic Promotion, Method Calling.
2. Programs on Classes: String and Math.
3. Write a program to demonstrate following Function concepts i) Function overloading ii) Constructors of all types iii) Default parameters, returning by reference
4. Programs on dealing with Arrays.
5. Programs on Classes: String and Math.
6. Programs on Inheritance and Polymorphism.
7. Programs on Garbage collection, packaging, access Modifiers, as well as static and abstract modifiers.
8. Programs on Interfaces block initializers, final Modifier, as well as static and dynamic binding.
9. Programs on Exception Handling.
10. Write a Java program that illustrates the following a) Creation of simple package. b) Accessing a package. c) Implementing interfaces.

SUBJECT CODE BTDS250E308LA	SUBJECT Business Communication and Intelligence	CREDITS 1
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Teaching Scheme	Examination Scheme
Theory: Tutorial : Practical: 2 Hrs. / Week	Continuous Assessment: 50 Marks Mid-Semester Exam: End Semester Exam:

Course Objectives:-

1	Develop effective verbal and written communication skills.
2	Enhance business presentation and interpersonal skills.
3	Understand professional communication tools and etiquette.
4	Apply communication in business decision-making.
5	Improve analytical thinking in communication contexts.

Course Outcomes:-

C01	Understand fundamentals of business communication.
C02	Demonstrate effective oral and written communication.
C03	Apply communication in professional scenarios.
C04	Analyze communication strategies in organizations.
C05	Develop teamwork and leadership communication skills.

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes											
	(3/2/1 indicates strength of correlation)											
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	--	--	--	--	--	--	--	2	2	3	--	1
C02	--	--	--	--	--	--	--	--	3	3	--	1
C03	--	--	--	--	--	--	--	--	3	3	--	1
C04	--	--	--	--	--	2	--	2	2	3	--	1
C05	--	--	--	--	--	--	--	--	3	2	1	2

Study / Practical Activities

1. Resume and cover letter drafting
2. Group discussion practice
3. Presentation using PPT
4. Business email writing
5. Case study on communication failure
6. Mock interview sessions
7. Report writing
8. Team-based communication exercise

SUBJECT CODE BTDS250E308LB	SUBJECT Engineering Economics	CREDITS 1
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Teaching Scheme	Examination Scheme
Theory: Tutorial : Practical: 2 Hrs. / Week	Continuous Assessment: 50 Marks Mid-Semester Exam: End Semester Exam:

Course Objectives:-

1	Understand economic principles in engineering decisions.
2	Analyze cost, profit, and financial feasibility.
3	Apply economic evaluation techniques.
4	Study market and demand analysis.
5	Develop financial decision-making skills.

Course Outcomes:-

C01	Understand basic economic concepts.
C02	Apply cost and financial analysis methods.
C03	Evaluate engineering projects economically.
C04	Analyze market and economic conditions.
C05	Develop financial planning skills.

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes (3/2/1 indicates strength of correlation)											
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	2	2	--	--	--	--	--	--	--	--	3	1
C02	--	3	--	2	--	--	--	--	--	--	3	1
C03	--	--	3	--	--	--	--	--	--	--	3	1
C04	--	--	--	--	--	2	--	2	--	--	3	1
C05	--	--	--	--	--	--	--	--	--	--	2	3

Study / Practical Activities

1. Cost estimation problems
2. Break-even analysis
3. Case study on project feasibility
4. Time value of money calculation
5. Demand-supply analysis
6. Investment comparison study
7. Economic decision case study
8. Financial report preparation

SUBJECT CODE BTDS250E308LC	SUBJECT Digital Marketing Fundamentals	CREDITS 1
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Teaching Scheme	Examination Scheme
Theory: Tutorial : Practical: 2 Hrs. / Week	Continuous Assessment: 50 Marks Mid-Semester Exam: End Semester Exam:

Course Objectives:-

1	Understand digital marketing concepts and tools.
2	Learn SEO, SEM, and social media marketing.
3	Analyze digital campaigns and performance.
4	Apply marketing strategies in online platforms.
5	Develop digital content and branding skills.

Course Outcomes:-

C01	Understand digital marketing basics.
C02	Apply SEO and social media tools.
C03	Analyze digital marketing campaigns.
C04	Design digital marketing strategies.
C05	Develop online branding and content.

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes (3/2/1 indicates strength of correlation)											
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	--	2	--	--	3	--	--	--	1	3	--	1
C02	--	--	3	--	3	--	--	--	2	3	--	1
C03	--	--	--	2	3	--	--	--	1	3	--	1
C04	--	--	3	--	3	--	--	--	3	2	--	1
C05	--	--	--	--	2	--	--	--	2	2	2	3

Study / Practical Activities

1. SEO keyword analysis
2. Social media campaign design
3. Google Ads demo study
4. Website traffic analysis
5. Content creation task
6. Email marketing simulation
7. Case study on digital campaigns
8. Analytics report preparation

SUBJECT CODE BTDS250E308LD	SUBJECT Introduction to Data Science	CREDITS 1
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Teaching Scheme	Examination Scheme
Theory: Tutorial : Practical: 2 Hrs. / Week	Continuous Assessment: 50 Marks Mid-Semester Exam: End Semester Exam:

Course Objectives:-

1	Understand data science concepts and lifecycle.
2	Learn data preprocessing and visualization.
3	Apply statistical and machine learning techniques.
4	Analyze data using tools (Python/R).
5	Develop data-driven decision-making skills.

Course Outcomes:-

C01	Understand data science fundamentals.
C02	Apply data preprocessing and analysis.
C03	Implement basic machine learning models.
C04	Analyze and interpret data insights.
C05	Develop data-driven solutions.

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes											
	(3/2/1 indicates strength of correlation)								3-Strong, 2-Medium, 1-Weak			
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	3	--	--	2	--	--	--	--	--	--	1
C02	--	3	--	3	3	--	--	--	--	--	--	1
C03	--	--	3		3	--	--	--	--	--	--	1
C04	--	--	--	3	3	--	--	--	--	2	--	1
C05	--	--	--	--	2	--	--	--	--	--	--	3

Study / Practical Activities

1. Data cleaning using Python
2. Data visualization using charts
3. Regression model implementation
4. Classification problem solving
5. Dataset analysis project
6. Statistical analysis using tools
7. Case study on data-driven decisions
8. Mini data science project

SUBJECT CODE BTDS25HM309	SUBJECT Case Study/EDP Programme/ Start Up Activity	CREDITS 2
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Teaching Scheme	Examination Scheme
Theory: Tutorial : Practical: 4 hrs/ week	Continuous Assessment: 50 Marks Mid-Semester Exam: End Semester Exam:

Course Objectives:-

1	Understand the role of data science in entrepreneurship and startup ecosystems.
2	Analyze real-world case studies using data-driven approaches.
3	Develop innovative startup ideas using data analytics and problem-solving skills.
4	Apply business intelligence and data science tools for decision-making.
5	Build skills in project planning, teamwork, and entrepreneurial thinking.

Course Outcomes:-

C01	Analyze datasets to support startup ideas and business decisions.
C02	Identify real-world problems and propose data-driven solutions.
C03	Design a basic startup model using data science techniques.
C04	Apply modern tools for data analysis, visualization, and reporting.
C05	Demonstrate teamwork, communication, and entrepreneurial skills.

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes (3/2/1 indicates strength of correlation)											
	3-Strong, 2-Medium, 1-Weak											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	2	3	2	--	2	--	--	--	--	--	2	2
C02	3	3	--	3	3	--	--	--	--	--	2	--
C03	2	2	3	--	2	--	--	--	1	--	3	--
C04	--	2	--	3	3	--	--	--	--	--	2	--
C05	--	--	--	--	2	--	--	--	3	3	2	3

Guidelines :

1. Students should select a real-world problem or startup idea and perform data analysis using relevant datasets.
2. Use tools such as Python, Excel, or visualization tools for data interpretation and insights generation.
3. Prepare a detailed report and presentation including problem statement, methodology, analysis, and conclusions.
4. Work in teams to encourage collaboration, innovation, and entrepreneurial mindset.

SUBJECT CODE BTDS25VEC310	SUBJECT Basics of Human Rights	CREDITS 1
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Teaching Scheme	Examination Scheme
Theory: 1 Hrs. / Week Tutorial : Practical:	Continuous Assessment: 50 Marks Mid-Semester Exam: End Semester Exam:

Course Objectives:-

1	To understand the meaning, history, and importance of human rights.
2	To examine the constitutional and legal framework for protection of human rights in India.
3	To study international human rights instruments and global efforts.
4	To analyze major human rights issues in India.
5	To understand mechanisms for protection and promotion of human rights.

Course Outcomes:-

C01	Explain the concept, features, and evolution of human rights.
C02	Describe the constitutional and legal safeguards for human rights in India.
C03	Summarize major international human rights instruments and conventions.
C04	Analyze contemporary human rights issues in India.
C05	Evaluate mechanisms and institutional efforts for protection and promotion of human rights.

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes											
	(3/2/1 indicates strength of correlation)											
	3-Strong, 2-Medium, 1-Weak											
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	2	2	–	–	–	1	1	3	–	2	–	2
C02	2	2	–	1	–	2	1	3	–	2	–	2
C03	2	2	–	1	–	2	1	3	–	2	–	2
C04	1	3	1	2	–	3	2	3	1	2	–	2
C05	1	2	1	2	–	3	2	3	2	3	–	3

COURSE CONTENTS**UNIT I: Introduction to Human Rights****(03 Hours)**

Definition and Meaning of Human Rights, Historical Development of Human Rights, Significance and Features of Human Rights, Universal Declaration of Human Rights, Types of Human Rights including Civil, Political, Economic, Social and Cultural Rights.

UNIT II: Constitutional and Legal Framework**(03 Hours)**

Indian Constitution and Human Rights, Fundamental Rights and Duties, Directive Principles of State Policy, National Human Rights Commission, Role of Judiciary in Protection of Human Rights.

UNIT III: International Human Rights**(03 Hours)**

United Nations and Human Rights, International Covenants and Treaties, Convention on the Rights of the Child, Convention on the Elimination of All Forms of Discrimination Against Women, Human Rights Violations and Global Efforts.

UNIT IV: Human Rights Issues in India**(03 Hours)**

Gender-based Discrimination and Women's Rights, Child Labour and Rights of Children, Rights of Minorities and Marginalized Communities, Human Trafficking and Exploitation, Environmental Rights and Sustainable Development.

UNIT V: Protection and Promotion of Human Rights**(03 Hours)**

Mechanisms for Human Rights Protection, Role of NGOs and Civil Society, Role of Media and Awareness Campaigns, Human Rights Education in Schools and Colleges, Case Studies including Landmark Human Rights Judgments in India.

Text Books:

1. **Human Rights under International Law and Indian Law**, S. K. Kapoor, Central Law Publications
2. **Human Rights in India**, R. C. Sharma, Deep & Deep Publications

Reference Books:

1. **Human Rights and the Law** – Justice M. Jagannadha Rao, Universal Law Publishing.
2. **Human Rights in India** – B. G. Verghese, Orient BlackSwan.
3. **National Human Rights Commission (NHRC) Reports** – National Human Rights Commission.
4. **United Nations Human Rights Documents** – United Nations.

SUBJECT CODE BTDS25VEC311	SUBJECT Indian Constitution- Value Education	CREDITS 1
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Teaching Scheme	Examination Scheme
Theory: 1 Hrs. / Week Tutorial : Practical:	Continuous Assessment: 50 Marks Mid-Semester Exam: End Semester Exam:

Course Objectives:-

1	Understand structure of Indian Constitution.
2	Learn fundamental rights and duties.
3	Study governance and legal system.
4	Understand role of judiciary.
5	Explore laws related to engineering.

Course Outcomes: -

C01	Identify and explore the basic features and modalities about Indian constitution.
C02	Differentiate and relate the functioning of Indian parliamentary system at the center and state level.
C03	Differentiate different aspects of Indian Legal System and its related bodies.
C04	Discover and apply different laws and regulations related to engineering practices.
C05	Correlate role of engineers with different organizations and governance models.

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes											
	(3/2/1 indicates strength of correlation)											
	3-Strong, 2-Medium, 1-Weak											
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	--	--	--	--	--	3	--	2	--	--	--	--
C02	--	--	--	--	--	3	--	--	2	--	--	--
C03	--	--	--	--	--	3	--	3	--	--	--	--
C04	--	--	--	--	--	3	--	--	--	--	2	--
C05	--	--	--	--	--	3	--	--	--	2	--	--

COURSE CONTENTS**UNIT - I: Introduction and Basic Information about Indian Constitution [03 Hrs]**

Meaning of the constitution law and constitutionalism, Historical Background of the Constituent Assembly, Government of India Act of 1935 and Indian Independence Act of 1947, Enforcement of the Constitution, Indian Constitution and its Salient Features, The Preamble of the Constitution, Fundamental Rights, Fundamental Duties, Directive Principles of State Policy, Parliamentary System, Federal System, Centre- State Relations, Amendment of the Constitutional Powers and Procedure, The historical perspectives of the constitutional amendments in India, Emergency Provisions: National Emergency, President Rule, Financial

Emergency, and Local Self Government – Constitutional Scheme in India.

UNIT - II: Union Executive and State Executive

[03 Hrs]

Powers of Indian Parliament Functions of Rajya Sabha, Functions of Lok Sabha, Powers and Functions of the President, Comparison of powers of Indian President with the United States, Powers and Functions of the Prime Minister, Judiciary – The Independence of the Supreme Court, Appointment of Judges, Judicial Review, Public Interest Litigation, Judicial Activism, LokPal, Lok Ayukta, The Lokpal and Lok ayuktas Act 2013, State Executives – Powers and Functions of the Governor, Powers and Functions of the Chief Minister, Functions of State Cabinet, Functions of State Legislature, Functions of High Court and Subordinate Courts.

UNIT - III: Introduction and Basic Information about Legal System

[03 Hrs]

The Legal System: Sources of Law and the Court Structure: Enacted law -Acts of Parliament are of primary legislation, Common Law or Case law, Principles taken from decisions of judges constitute binding legal rules. The Court System in India and Foreign Courtiers (District Court, District Consumer Forum, Tribunals, High Courts, Supreme Court). Arbitration: As an alternative to resolving disputes in the normal courts, parties who are in dispute can agree that this will instead be referred to arbitration. Contract law, Tort, Law at workplace

UNIT - IV: Intellectual Property Laws and Regulation to Information

[03 Hrs]

Intellectual Property Laws- Introduction, Legal Aspects of Patents, Filing of Patent Applications, Rights from Patents, Infringement of Patents, Copyright and its Ownership, Infringement of Copyright, Civil Remedies for Infringement, Regulation to Information- Introduction, Right to Information Act, 2005, Information Technology Act, 2000, Electronic Governance, Secure Electronic Records and Digital Signatures, Digital Signature Certificates, Cyber Regulations Appellate Tribunal, Offences, Limitations of the Information Technology Act.

UNIT - V: Business Organizations and E-Governance

[03 Hrs]

Sole Traders, Partnerships: Companies: The Company's Act: Introduction, Formation of a Company, Memorandum of Association, Articles of Association, Prospectus, Shares, Directors, General Meetings and Proceedings, Auditor, Winding up. E-Governance and role of engineers in E- Governance, Need for reformed engineering serving at the Union and State level, Role of I.T. professionals in Judiciary, Problem of Alienation and Secessionism in few states creating hurdles in Industrial development.

TEXT BOOK

Text Book and Teachers Manual:

1. The Textbook: *A Foundation Course in Human Values and Professional Ethics*, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. The Teacher's Manual: *Teachers' Manual for A Foundation Course in Human Values and Professional Ethics*, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978- 93-87034-53-2

REFERENCE BOOKS

1. Brij Kishore Sharma: Introduction to the Indian Constitution, PHI, New Delhi, latest edition.
2. Granville Austin: The Indian Constitution: Cornerstone of a Nation. 1966, Oxford Clarendon Press.
3. Subhash C. Kashyap: Our Constitution: An Introduction to India's
4. Constitution and constitutional Law, NBT, 2018.
5. PM Bakshi: The Constitution of India, Latest Edition, Universal Law Publishing.
6. V.K. Ahuja: Law Relating to Intellectual Property Rights (2007)
7. Suresh T. Viswanathan: The Indian Cyber Laws, Bharat Law House, New
8. Delhi-88
9. P. Narayan: Intellectual Property Law, Eastern Law House, New Delhi
10. Prabudh Ganguli: Gearing up for Patents: The Indian Scenario, Orient Longman.
11. BL Wadehra: Patents, Trademarks, Designs and Geological Indications. Universal Law Publishing - LexisNexis.
12. Intellectual Property Rights: Law and Practice, Module III by ICSI (only relevant sections)
13. Executive programme study material Company Law, Module II, by ICSI (The Institute of Companies Secretaries of India) (Only relevant sections i.e., Study 1, 4 and 36).
<https://www.icsi.edu/media/webmodules/publications/Company%20Law.pdf>
14. Handbook on e-Governance Project Lifecycle, Department of Electronics & Information Technology, Government of India,
[https://www.meity.gov.in/writereaddata/files/eGovernance Project Lifecycle le Participant Handbook-5Day CourseV1 20412.pdf](https://www.meity.gov.in/writereaddata/files/eGovernance%20Project%20Lifecycle%20Participant%20Handbook-5Day%20CourseV1%202012.pdf)
15. Companies Act, 2013 Key highlights and analysis by PWC.

SUBJECT CODE BTDS25CEP312	SUBJECT Field Visit/Special Study/ Internship/ Social Activity Project/ Community Initiative	CREDITS 2
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Teaching Scheme	Examination Scheme
Theory: Tutorial : Practical: 4 hrs/ week	Continuous Assessment: 50 Marks Mid-Semester Exam: End Semester Exam:

Course Objectives:-

1	Understand real-world applications of data science in industry, society, and community initiatives.
2	Gain practical exposure to data collection, processing, and analysis in field environments.
3	Apply data science techniques to solve social or organizational problems.
4	Develop professional skills through internships, field visits, or community-based projects.
5	Enhance awareness of ethical, societal, and sustainability aspects in data-driven solutions.

Course Outcomes:-

C01	Apply data science knowledge to real-world problems in industry or society.
C02	Collect, preprocess, and analyze data from field or organizational sources.
C03	Develop solutions addressing social, environmental, or business challenges.
C04	Use modern tools for data analysis, visualization, and reporting.
C05	Demonstrate teamwork, communication, ethics, and professional responsibility.

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes (3/2/1 indicates strength of correlation)											
	3-Strong, 2-Medium, 1-Weak											
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	2	3	2	--	2	2	2	--	--	--	2	2
C02	3	3	--	3	3	--	--	--	--	--	2	--
C03	2	2	3	--	2	2	2	--	1	--	3	--
C04	--	2	--	3	3	--	--	--	--	--	2	--
C05	--	--	--	--	1	3	2	3	3	3	2	3

Guidelines:

1. Students should participate in at least one field visit, internship, or community-based project related to data collection or analysis.
2. Identify a real-life problem (social, environmental, or industrial) and apply data science methods to analyze it.
3. Use appropriate tools such as Python, Excel, Power BI, or statistical methods for data processing and visualization.
4. Submit a comprehensive report and presentation including objectives, methodology, data insights, and impact of the project.

SUBJECT CODE BTDS25PC401	SUBJECT Computer Organization & Architecture	CREDITS 3
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Teaching Scheme	Examination Scheme
Theory: 3 Hrs. / Week Tutorial : Practical:	Continuous Assessment: 20 Marks Mid-Semester Exam: 20 Marks End Semester Exam: 60 Marks

Course Objectives:-

1	To introduce the basic structure and functional units of computer systems.
2	Interpret instruction set architectures, addressing modes, and execution flow, and compare RISC and CISC architectures
3	Apply principles of computer arithmetic to perform integer and floating-point operations, and analyse ALU design
4	Evaluate memory organisation techniques, including cache, virtual memory, and external storage systems, for performance and reliability
5	Analyse control unit design, I/O organisation, pipelining, and parallel processing techniques for improving system performance

Course Outcomes:-

CO1	Describe the basic structure and operation of a digital computer
CO2	Illustrate instruction formats, addressing modes, and execution of instructions.
CO3	Analyze arithmetic operations and design of ALU
CO4	Explain memory hierarchy, cache mapping techniques, and virtual memory concepts
CO5	Evaluate I/O organization and system buses

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes (3/2/1 indicates strength of correlation)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	--	--	--	--	--	--	--	--	--	--	--
CO2	3	2	--	--	--	--	--	--	--	--	--	--
CO3	3	2	2	--	--	--	--	--	--	--	--	--
CO4	3	2	2	2	--	--	--	--	--	--	--	--
CO5	3	2	2	2	2	--	--	--	--	--	--	--

COURSE CONTENTS**UNIT 1 Introduction****[7 Hours]**

Introduction: Concept of computer organization and architecture, Fundamental unit, Computer function and interconnection, CPU structure and function.

UNIT 2 Instruction Sets**[7 Hours]**

Characteristics, Types of operands, Types of operations, Assembly language, Addressing

modes, Instruction format, Types of instruction, Instruction execution, Machine state and processor status, Structure of program, Introduction to RISC and CISC architecture.

UNIT 3 Computer Arithmetic

[8 Hours]

The arithmetic and logic Unit, Integer representation, Integer arithmetic, Floating point representation, Floating point arithmetic, Introduction of arithmetic co-processor.

UNIT 4 Memory Organization

[9 Hours]

Internal Memory: Semiconductor main memory, error correction, advanced DRAM organisation, virtual memory systems, and cache memory systems. External Memory: Organisation and characteristics of magnetic disks, magnetic tapes, optical memory, RAID, and memory controllers.

UNIT 5 Control Unit and Input / Output Organization

[9 Hours]

Control Unit Operation: Micro-operations, Control of the processor, Hardwired implementation, Micro-programmed Control Unit, Basic concepts, Microinstruction sequencing, Microinstruction execution, Applications of micro-programming. Input / Output Organization: External devices, I/O module, Programmed I/O, Interrupt driven I/O, Direct memory access, I/O channels and processors, External interface. Instruction Pipe-lining and Parallel processing: Multiple processor organization, Symmetric multiprocessor, Cache coherence and the MESI protocol. .

REFERENCE BOOKS:

1. William Stalling, Computer Organisation and Architecture: Designing for Performance, Prentice Hall Publication, 8th Edition, 2009.
2. Hayes, Computer Architecture and Organization, McGraw-Hill Publication, 3rd Edition, 2012.
3. Zaky, Computer Organization, McGraw-Hill Publication, 5th Edition, 2011.
4. Hennessy and Patterson, Computer Architecture: A Quantitative Approach, Morgan and Kaufmann Publication, 4th Edition, 2007.
5. Morris Mano, Computer System Architecture, Pearson Education India, 3rd Edition, 2007.
6. Mostafa Abd-El-Barr, Hesham El-Rewini, Fundamentals of Computer Organization and Architecture, Wiley Publication, 1st Edition, 2004.
7. Miles J. Murdocca, Vincent P. Heuring, Computer Architecture and Organization: An Integrated Approach, Wiley Publication, 1st Edition, 2007.
8. Sajjan G. Shiva, Computer Organization: Design, and Architecture, CRC Press, 5th Edition, 2013.

SUBJECT CODE BTDS25PC402	SUBJECT Analysis and Design of Algorithms	CREDITS 3
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Teaching Scheme	Examination Scheme
Theory: 3 Hrs. / Week Tutorial : Practical:	Continuous Assessment: 20 Marks Mid-Semester Exam: 20 Marks End Semester Exam: 60 Marks

Course Objectives:-

1	To understand fundamental concepts of algorithm design and analysis.
2	To learn various algorithm design techniques like divide and conquer.
3	To study greedy, dynamic programming, and backtracking methods.
4	To analyze time and space complexity of algorithms.
5	To explore optimization and problem-solving strategies.

Course Outcomes:-

C01	Be able to analyze algorithms and improve the efficiency of algorithms.
C02	Apply different designing methods for development of algorithms to realistic problems, such as divide and conquer, greedy and etc.
C03	Prerequisites (Subjects) Data structures, Mathematical foundations of computer science.
C04	To solve problems using algorithm design methods such as the greedy method, divide and conquer, dynamic programming, backtracking and branch and bound.
C05	Ability to understand and estimate the performance of algorithm.

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes (3/2/1 indicates strength of correlation)											
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	3	--	--	2	--	--	--	--	--	--	1
C02	--	3	--	2	--	--	--	--	--	--	--	1
C03	3	--	3	--	3	--	--	--	--	--	--	1
C04	--	--	3	2	3	--	--	--	--	--	--	1
C05	--	3	--	3	--	--	--	--	--	--	--	1

COURSE CONTENTS**[Unit 1] Introduction to Algorithms****[09 Hours]**

Introduction: Definition, Properties of Algorithms, Expressing Algorithm, Flowchart, **Algorithm Design Techniques:** Performance Analysis of Algorithms, Types of Algorithm's Analysis, Order of Growth, Asymptotic Notations.

Recursion: Recurrences Relation, Substitution Method, Iterative Method, Recursion Tree, Master Theorem.

[Unit 2] Divide and Conquer**[08 Hours]**

Introduction, Binary Search, Merge Sort, Quick Sort, Strassen's Matrix Multiplication.

[Unit 3] Backtracking**[08 Hours]**

Backtracking: Concept, N-Queens Problem, Four-Queens Problem, Eight-Queen Problem, Hamiltonian Cycle, Sum of Subsets Problem, Graph Coloring Problem.

Branch and Bound: Introduction, Travelling Salesperson Problem, 15-Puzzle Problem, Comparisons between Backtracking and Branch and Bound.

[Unit 4] Greedy Algorithms**[09 Hours]**

Introduction to Greedy Technique, Greedy Method, Optimal Merge Patterns, Huffman Coding, Knapsack Problem, Activity Selection Problem, Job Sequencing with Deadline, Minimum Spanning Tree, Single-Source Shortest Path Algorithms.

[Unit 5] Dynamic Programming**[09 Hours]**

Introduction, Characteristics of Dynamic Programming, Component of Dynamic Programming, Comparison of Divide-and-Conquer and Dynamic Programming Techniques, Longest Common Sub-sequence.

Shortest Path: Bellman Ford, Floyd Warshall, Application of Dynamic Programming.

NP Completeness: Introduction, The Complexity Class P, The Complexity Class NP, Polynomial-Time Reduction, The Complexity Class NP-Complete.

TEXT BOOK:

1. T. Cormen, Introduction to Algorithms, PHI Publication, 2nd Edition, 2002.

REFERENCE BOOKS:

1. Aho, Ullman, Data Structure and Algorithms, Addison-Wesley Publication, 1st Edition, 1983.
2. Michel Goodrich, Roberto Tamassia, Algorithm Design – Foundation, Analysis & Internet Examples, Wiley Publication, 2nd Edition, 2006.
3. George T. Heineman, Gary Pollice, Stanley Selkow, Algorithms in a Nutshell, A Practical Guide, O'Reilly Media, 2nd Edition, 2016.
4. Ellise Horowitz, Sartaj Sahni, S. Rajasekaran, Fundamentals of Computer Algorithms, University Press (India) Private Ltd, 2nd Edition, 2008.
5. Sara Base, Computer algorithms: Introduction to Design and Analysis, Addison-Wesley Publication, 2nd Edition, 1988.

SUBJECT CODE BTDS25PC403	SUBJECT Digital Electronics and Logic Design	CREDITS 2
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Teaching Scheme	Examination Scheme
Theory: 2 Hrs. / Week Tutorial : Practical:	Continuous Assessment: 20 Marks Mid-Semester Exam: 20 Marks End Semester Exam: 60 Marks

Course Objectives:-

1	To understand number systems and binary arithmetic operations.
2	To study Boolean algebra and logic gate implementations.
3	To design combinational logic circuits.
4	To analyze sequential circuits and flip-flops.
5	To explore ADC, DAC, and memory concepts.

Course Outcomes:-

CO1	Familiar with various number systems and Boolean algebra.
CO2	Design and analyse any digital logic gate circuits and Flip flop based systems.
CO3	Gain the capability of implementing various counters.
CO4	Describe the operation of ADC and DAC circuits.
CO5	Acquire basic knowledge on VHDL.

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes (3/2/1 indicates strength of correlation)											
	3-Strong, 2-Medium, 1-Weak											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	--	--	--	--	--	--	--	--	--	1
CO2	3	3	--	--	--	--	--	--	--	--	--	1
CO3	3	2	2	--	2	--	--	--	--	--	--	1
CO4	2	2	3	--	2	--	--	--	--	--	--	1
CO5	2	2	--	2	2	--	--	--	--	--	--	1

COURSE CONTENTS**UNIT - I****[05 Hours]**

Number Systems and Codes: Binary, Octal and hexadecimal conversions- ASCII code, Excess -3 code, Gray code, Error detection and correction - Parity generators and checkers – Fixed point and floating point arithmetic. Binary addition and subtraction, unsigned and signed numbers, 1's complement and 2's complement arithmetic.

UNIT - II**[05 Hours]**

Logic gates, Universal gates - Boolean Laws and theorems, Sum of Products method, Product of Sum method – K map representation and simplification (upto four variables) - Pairs,

Quads, Octets, Dont care conditions.

UNIT – III

[05 Hours]

Combinational circuits: Adders _ Full adder and half adder – Subtractors, half subtractor and full subtractor – Carry Look ahead adders – ALU(block diagram only). Multiplexers, Demultiplexers, Encoders, BCD to decimal decoders.

UNIT – IV

[07 Hours]

Sequential circuits: Flip-Flops, SR, JK, D and T flip-flops, JK Master Slave Flip-flop, Conversion of flip-flops, Registers -SISO,SIPO, PISO, PIPO. Counters : Asynchronous Counters – Modulus of a counter – Mod N counters. Synchronous counters: Preset and clear modes.

UNIT – V

[07 Hours]

State Machines: State transition diagram, Moore and Mealy Machines – Design equation and circuit diagram. Digital to Analog conversion – R-2R ladder, weighted resistors. Analog to Digital Conversion - Flash ADC, Successive approximation, Integrating ADC. Memory Basics, Read and Write, Addressing, ROMs, PROMs and EPROMs, RAMs.

TEXT BOOK:

1. Floyd T.L, Digital Fundamentals , 10/e, Pearson Education, 2011 2.
2. C.H.Roth and L.L.Kimney Fundamentals of Logic Design, 7/e, Cengage Learning, 2013

REFERENCE BOOKS:

1. Donald P Leach, Albert Paul Malvino and GoutamSaha., Digital Principles and Applications, 8/e, by Mc Graw Hill
2. Mano M.M, Logic and Computer Design Fundamentals, 4/e, , Pearson Education.
3. Tocci R.J and N.S.Widmer, Digital Systems, Principles and Applications, 11/e, , Pearson Education.
4. John F. Wakerly, Digital Design: Principles and Practices, 4/e, , Pearson, 2005
5. Taub & Schilling: Digital Integrated Electronics, McGraw Hill,1997

SUBJECT CODE BTDS250E405A	SUBJECT Introduction to Financial Accounting	CREDITS 2
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Teaching Scheme	Examination Scheme
Theory: 2 Hrs. / Week Tutorial : Practical:	Continuous Assessment: 20 Marks Mid-Semester Exam: 20 Marks End Semester Exam: 60 Marks

Course Objectives:-

1	To introduce basic accounting principles and concepts.
2	To understand the accounting cycle and recording transactions.
3	To study preparation of financial statements.
4	To analyze financial performance using accounting tools.
5	To apply accounting knowledge in decision-making.

Course Outcomes:-

C01	Identify and apply basic accounting concepts.
C02	Prepare essential financial statements.
C03	Analyze financial performance using ratio analysis.
C04	Evaluate engineering projects through financial lenses.
C05	Utilize accounting information for strategic decision-making.

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes (3/2/1 indicates strength of correlation)											
	3-Strong, 2-Medium, 1-Weak											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	2	2	--	--	--	--	--	--	--	--	3	1
C02	--	3	--	2	--	--	--	--	--	--	3	1
C03	--	--	2	--	--	--	--	--	--	--	3	1
C04	--	--	--	--	--	2	--	2	--	--	3	1
C05	--	--	--	--	--	--	--	--	--	--	2	3

COURSE CONTENTS**UNIT - I Introduction to Accounting****[06 Hours]**

Introduction to Accounting: Importance - Objectives - Principles. GAAP: Accounting Concepts and Conventions. Accounting System: Double Entry System - Recording Business Transactions - Classification of Accounts - Accounting Cycle - Users of Accounting Information.

UNIT - II The Accounting Process**[06 Hours]**

Overview: Accounting Process. Books of Original Record: Journal - Ledger - Trial Balance (Problems) - Classification of Capital and Revenue Expenses - Final Accounts with

Adjustments (Problems) - Cash Book and other Subsidiary books. (Only Theory)

UNIT - III Depreciation and Shares and Debentures [06 Hours]

Depreciation: Concept - Methods of Depreciation: their impact on measurement of business Accounting - Straight Line Method (Problems) - Written down Value Method (Problems). Shares and Debentures: Entries for Issue of shares (Problems) - Forfeiture (Problems) - Issue of shares at Discount and premium (Problems) - Issue and Redemption of Debentures. (Problems)

UNIT - IV Financial Analysis-I [06 Hours]

Working Capital: Statement of Changes in Working Capital - Funds from Operations - Paid Cost and Unpaid Costs. Financial Analysis: Introduction to Funds Flow Statement - Cash Flow Statement vs. Funds Flow Statement - Preparation and Analysis of Cash Flow Statement (Problems)

UNIT - V Financial Analysis-II [06 Hours]

Financial Statement Analysis: Analysis and Interpretation of Financial Statements from Investor and Company point of view - Horizontal Analysis and Vertical Analysis of Company Financial Statements - Liquidity - Leverage - Solvency and Profitability Ratios. (Problems) Techniques: Du Pont Chart - Window Dressing - Limitations of Financial Statements. Accounting Standards (AS) Issued by ICAI-IFRS. Case Study on Financial Reporting & Analysis (FRAs).

TEXT AND REFERENCE BOOKS:

1. Dhanesh K. Khatri, Financial Accounting & Analysis, TMH, New Delhi.
2. PK Jain and K. L. Narang, Financial Accounting & Analysis, Kalyani Publications.
3. Narayana Swamy, Financial Accounting & Analysis, PHI.
4. V. Rajasekharam, Financial Accounting & Analysis, Pearson Education, New Delhi.
5. Ranjan Kumar Bal, Financial Accounting & Analysis, S. Chand, New Delhi.
6. Maheswari, Financial Accounting, IBH.

SUBJECT CODE BTDS250E405B	SUBJECT Probability and Statistics	CREDITS 2
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Teaching Scheme	Examination Scheme
Theory: 2 Hrs. / Week Tutorial : Practical:	Continuous Assessment: 20 Marks Mid-Semester Exam: 20 Marks End Semester Exam: 60 Marks

Course Objectives:-

1	To understand basic probability concepts and distributions.
2	To study statistical measures and data representation.
3	To learn hypothesis testing methods.
4	To analyze correlation and regression techniques.
5	To apply statistical tools in engineering problems.

Course Outcomes:-

C01	Understand the basic probability concepts and random variables that have numerous applications in computer science.
C02	Apply the concept of distribution functions in web data and traffic network modeling in computer science engineering.
C03	Analyze statistics and its applications in simulation, data mining and reliability theory
C04	Determine the process constructing linear and non-linear curves through the method of least square and understand its usage in binary mixtures.
C05	Identify the concept of statistical quality control in computer science and mechanical engineering.

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes (3/2/1 indicates strength of correlation)											
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	3	--	2	--	--	--	--	--	--	--	1
C02	3	3	--	3	--	--	--	--	--	--	--	1
C03	--	3	--	3	2	--	--	--	--	--	--	1
C04	--	--	3	--	2	--	--	--	--	--	--	1
C05	--	--	--	--	--	--	--	--	--	--	--	3

COURSE CONTENTS**UNIT - I Data classification, Representation and Probability****[06 Hours]**

Diagrammatic and graphical representation – measures of central tendency, dispersion and its importance. Basic concept of probability – random variables – discrete and continuous random variables –moment generating function - expectation

UNIT - II Distribution functions**[05 Hours]**

Binomial distribution – poisson distribution and normal distribution – related properties.

UNIT - III Test of Hypothesis**[06 Hours]**

Population and sample – confidence interval of mean from normal distribution – statistical hypothesis – null and alternative hypothesis- level of significance. Test of significance – test based on normal distribution –z test for means and proportions.

UNIT - IV Test of Significance**[06 Hours]**

Small samples – t – test for one sample and two sample problem, f – test and chi-square test (testing of goodness of fit and independence).

UNIT - V Correlation-Regression**[06 Hours]**

Rank correlation – correlation coefficient – karl pearson's coefficient correlation – spearman rank correlation. Regression lines – standard error of estimation – classification of regression techniques – linear regression (lr) model.

TEXT BOOK:

1. T.K.V. Iyengar, B. Krishna Gandhi and Others, Probability and Statistics, S. Chand & Company
2. S.P. Gupta, Statistical methods, S. Chand Publications
3. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Alpha science International limited, 2016

REFERENCE BOOKS:

1. Erwin kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2011.
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
3. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
4. Miller and John E Freund, Probability and Statistics for Engineers, 5th Edition

SUBJECT CODE BTDS250E405C	SUBJECT Introduction to Robotics	CREDITS 2
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Teaching Scheme	Examination Scheme
Theory: 2 Hrs. / Week Tutorial : Practical:	Continuous Assessment: 20 Marks Mid-Semester Exam: 20 Marks End Semester Exam: 60 Marks

Course Objectives:-

1	To introduce fundamentals and applications of robotics.
2	To study kinematics and dynamics of robotic systems.
3	To understand control mechanisms in robots.
4	To learn mathematical modeling of robots.
5	To explore programming and simulation tools.

Course Outcomes:-

C01	Explain facts pertaining to robotics including history, sub-fields, and applications
C02	Explain the elementary concepts required for modelling robotic systems.
C03	Develop mathematical and mechanistic models for simple robotic systems.
C04	Use tools such as Robotics toolbox to program and visualize simple robotic systems
C05	This course intends to equip students with the ability to design and analyze simple and elementary robotic systems (Upto 4 DOF systems like SCARA) using mathematical and computational tools.

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes (3/2/1 indicates strength of correlation)											
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	2	2	--	3	--	--	--	--	--	--	1
C02	--	3	3	--	3	--	--	--	1	--	--	1
C03	--	--	3	2	3	--	--	--	2	--	--	1
C04	--	--	--	3	3	--	--	--	2	--	--	1
C05	--	--	--	--	2	--	--	--	2	--	2	3

COURSE CONTENTS**UNIT-I: Robotics Introduction****[05 Hours]**

Robot Introduction – Seven Criteria of Defining a Robot, Robot Controllers – Major Components, Robot Vocabularies – Robotics Middleware Basics.

UNIT-II: Programming the Robot's Sensors**[06 Hours]**

A close look at Sensors, Programming the Robot's Sensors, Programming the Actuators, Building Robot's Softbot.

UNIT-III: Robot Operating System (ROS)**[06 Hours]**

ROS Basics – ROS Equation, History of ROS, Sensors and Robots Supporting ROS, ROS Architecture and Concepts, ROS Filesystem Level, ROS Computation Graph Level, ROS Community Level.

UNIT-IV: ROS Fundamentals**[06 Hours]**

Ubuntu Linux for Robotics – Ubuntu Graphical User Interface, Shell Commands, C++ and Python for Robotic Programming – Basic Concepts with Examples.

UNIT – V Dynamics and Control of Simple Robotic Systems**[06 Hours]**

Introduction to rigid body kinetics, Euler-Lagrange equation of simple robotic systems, Forward and Inverse dynamics of simple robotic systems, Velocity based control of simple robotic systems, Torque based control of robotic systems.

TEXT BOOK:

1. Corke P. Robotics, Vision and Control. Springer; 2017.
2. Craig J J. Introduction to Robotics: Mechanics and Control. Pearson Publishing, 2017.

REFERENCE BOOKS:

1. Spong M.W., Hutchinson S. and Vidyasagar M, Robot Modeling and Control, Wiley, 2006
2. Saha S K, Introduction to Robotics, McGraw Hill publishing, 2014

SUBJECT CODE BTDS250E405D	SUBJECT Introduction to Quantum Computing	CREDITS 2
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Teaching Scheme	Examination Scheme
Theory: 2 Hrs. / Week Tutorial : Practical:	Continuous Assessment: 20 Marks Mid-Semester Exam: 20 Marks End Semester Exam: 60 Marks

Course Objectives:-

1	To understand fundamentals of quantum mechanics.
2	To study quantum computing principles and qubits.
3	To explore quantum gates and circuits.
4	To analyze quantum algorithms.
5	To learn programming tools for quantum computing.

Course Outcomes:-

CO1	Construct and interpret quantum circuit diagrams for various procedures.
CO2	Analyze and evaluate the performance of quantum algorithms like Grover's search and Shor's algorithm for factoring.
CO3	Implement quantum circuits using Python-based tools like Qiskit and simulate them on local machines.
CO4	Run simulations, interpret results, and validate quantum procedures.
CO5	Apply mathematical techniques to solve problems in quantum computation, such as calculating state vectors or gate operations.

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes (3/2/1 indicates strength of correlation)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	3	3	--	--	2	--	--	--	--	--	--	1
C02	--	3	--	3	3	--	--	--	--	--	--	1
C03	--	--	2	--	3	--	--	--	--	--	--	1
C04	--	--	--	3	3	--	--	--	--	--	--	1
C05	--	--	--	--	2	--	--	--	--	--	--	3

COURSE CONTENTS**UNIT - I****[06 Hours]**

Introduction: Elementary quantum mechanics; linear algebra for quantum mechanics, Quantum states in Hilbert space, The Bloch sphere, Density operators, generalized measurements, no-cloning theorem.

UNIT - II**[05 Hours]**

Quantum correlations: Bell inequalities and entanglement, Schmidt decomposition,

superdense coding, teleportation.

UNIT – III

[06 Hours]

Quantum cryptography: quantum key distribution.

UNIT – IV

[06 Hours]

Quantum gates and algorithms: Universal set of gates, quantum circuits, Solovay-Kitaev theorem, Deutsch-Jozsa algorithm, factoring.

UNIT – V

[06 Hours]

Programming a quantum computer: The IBMQ, coding a quantum computer using a simulator to carry out basic quantum measurement and state analysis.

TEXT BOOK:

1. Phillip Kaye, Raymond Laflamme et. al., An introduction to Quantum Computing, Oxford University press, 2007.
2. Chris Bernhardt, Quantum Computing for Everyone, The MIT Press, Cambridge, 2020
3. David McMahon-Quantum Computing Explained-Wiley-Interscience , IEEE Computer Society (2008)

REFERENCE BOOKS:

1. Quantum Computation and Quantum Information, M. A. Nielsen & I. Chuang, Cambridge University Press (2013).
2. Quantum Computing, A Gentle Introduction , Eleanor G. Rieffel and Wolfgang H. Polak MIT pre

SUBJECT CODE BTDS25AE406L	SUBJECT Analysis and Design of Algorithms Laboratory	CREDITS 1
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Teaching Scheme	Examination Scheme
Theory: Tutorial : Practical: 2 hrs/ week	Continuous Assessment: 50 Marks Mid-Semester Exam: End Semester Exam: 50 Marks

Course Objectives:-

1	To understand the practical implementation of logic gates.
2	To design and test combinational logic circuits.
3	To analyze the working of sequential circuits.
4	To implement flip-flops and counters.
5	To explore memory units and digital components.

Course Outcomes:-

CO1	Implement and verify logic gate operations experimentally.
CO2	Design and test combinational circuits like adders and multiplexers.
CO3	Analyze sequential circuits including flip-flops and registers.
CO4	Construct and evaluate different types of counters.
CO5	Demonstrate the working of memory units and storage devices.

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes (3/2/1 indicates strength of correlation)											
	3-Strong, 2-Medium, 1-Weak											
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	--	--	--	3	--	--	--	--	--	--	1
C02	--	2	--	--	3	--	--	--	--	--	--	1
C03	--	--	3	--	3	--	--	--	2	--	--	1
C04	--	--	--	2	3	--	--	--	--	2	--	1
C05	--	2	--	--	--	--	--	--	--	--	--	2

List of Practical's to be performed**(At least 08 experiments should be performed from the following list)**

1. Implementation of Divide and Conquer Technique implementation:
2. Implementation of Greedy Technique.
3. Implementation of Dynamic Programming
4. Implementation of Back-Tracking Technique
5. Implementation of Selecting Min. / Max. Kth smallest element
6. Implementation of Warshall's Algorithm
7. Implementation of Prim's Algorithm
8. Implementation of Kruskal's Algorithm
9. Implementation of Dijkstra's Algorithm
10. Implementation of Floyd-Warshall's Algorithm

SUBJECT CODE BTDS25AE407L	SUBJECT Digital Electronics and Logic Design Laboratory	CREDITS 1
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Teaching Scheme	Examination Scheme
Theory: Tutorial : Practical: 2 hrs/ week	Continuous Assessment: 50 Marks Mid-Semester Exam: End Semester Exam: 50 Marks

Course Objectives:-

1	To implement fundamental algorithm design techniques in programming.
2	To develop problem-solving skills using algorithmic approaches.
3	To understand practical performance of algorithms.
4	To analyze time and space complexity through implementation.
5	To explore real-world applications of algorithms.

Course Outcomes:-

C01	Implement algorithms using divide and conquer techniques.
C02	Develop solutions using greedy and dynamic programming methods.
C03	Apply backtracking and branch & bound techniques for complex problems.
C04	Analyze and compare algorithm performance using test cases.
C05	Solve real-world problems using efficient algorithmic approaches.

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes (3/2/1 indicates strength of correlation)											
	3-Strong, 2-Medium, 1-Weak											
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	--	--	--	3	--	--	--	--	--	--	1
C02	--	2	--	--	3	--	--	--	--	--	--	1
C03	--	--	3	--	3	--	--	--	2	--	--	1
C04	--	--	--	2	3	--	--	--	--	2	--	1
C05	--	2	--	--	--	--	--	--	--	--	--	2

List of Practical's to be performed**(At least 08 experiments should be performed from the following list)**

1. Digital Logic Gates: Investigate logic behavior of AND, OR, NOT.
2. Digital Logic Gates: Investigate logic behavior of NAND, NOR, EX-OR, EX-NOR.
3. Combinational circuits: design, assemble and test: adders and subtractors.
4. Combinational circuits: design, assemble and test: Comparators.
5. Design with multiplexers.
6. Design with demultiplexers.
7. Flip-flop: Study and investigate operation of SR, D.
8. Flip-flop: Study and investigate operation of JK Flip-flops.
9. Memory Unit: Study the behavior of RAM unit and its storage capacity.

SUBJECT CODE BTDS25AE408LA	SUBJECT Introduction to Financial Accounting	CREDITS 1
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Teaching Scheme	Examination Scheme
Theory: Tutorial : Practical: 2 hrs/ week	Continuous Assessment: 50 Marks Mid-Semester Exam: End Semester Exam: 50 Marks

Course Objectives:-

1	Understand basic accounting principles and concepts.
2	Learn preparation of financial statements.
3	Analyze financial transactions and records.
4	Apply accounting tools for decision-making.
5	Develop financial awareness for business.

Course Outcomes:-

C01	Understand accounting fundamentals and terminology.
C02	Record financial transactions systematically.
C03	Prepare financial statements.
C04	Analyze financial data for decision-making.
C05	Apply accounting knowledge in real scenarios.

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes (3/2/1 indicates strength of correlation)											
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	2	2	--	--	--	--	--	--	--	--	3	1
C02	--	3	--	2	--	--	--	--	--	--	3	1
C03	--	--	2	--	--	--	--	--	--	--	3	1
C04	--	--	--	--	--	2	--	2	--	--	3	1
C05	--	--	--	--	--	--	--	--	--	--	2	3

Study / Practical Activities

1. Journal and ledger preparation
2. Trial balance preparation
3. Final accounts (P&L, Balance Sheet)
4. Case study on financial statements
5. Depreciation calculation methods
6. Ratio analysis exercise
7. Bank reconciliation statement
8. Mini project on company financials

SUBJECT CODE BTDS25AE408LB	SUBJECT Probability & Statistics	CREDITS 1
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Teaching Scheme	Examination Scheme
Theory: Tutorial : Practical: 2 hrs/ week	Continuous Assessment: 50 Marks Mid-Semester Exam: End Semester Exam: 50 Marks

Course Objectives:-

1	Understand probability theory and statistical concepts.
2	Apply probability distributions and models.
3	Perform statistical analysis of data.
4	Interpret results for decision-making.
5	Develop analytical and problem-solving skills.

Course Outcomes:-

C01	Understand probability fundamentals.
C02	Apply probability distributions.
C03	Perform statistical data analysis.
C04	Interpret statistical results.
C05	Apply statistics in real-world problems.

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes (3/2/1 indicates strength of correlation)											
	3-Strong, 2-Medium, 1-Weak											
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	3	--	2	--	--	--	--	--	--	--	1
C02	3	3	--	3	--	--	--	--	--	--	--	1
C03	--	3	--	3	2	--	--	--	--	--	--	1
C04	--	--	3	--	2	--	--	--	--	--	--	1
C05	--	--	--	--	--	--	--	--	--	--	--	3

Study / Practical Activities

1. Probability problem solving
2. Binomial and normal distribution analysis
3. Mean, median, variance calculations
4. Hypothesis testing exercises
5. Correlation and regression analysis
6. Data visualization (graphs/charts)
7. Case study on statistical applications
8. Mini project on data analysis

SUBJECT CODE BTDS25AE408LC	SUBJECT Introduction to Robotics	CREDITS 1
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Teaching Scheme	Examination Scheme
Theory: Tutorial : Practical: 2 hrs/ week	Continuous Assessment: 50 Marks Mid-Semester Exam: End Semester Exam: 50 Marks

Course Objectives:-

1	Understand fundamentals of robotics systems.
2	Learn sensors, actuators, and control mechanisms.
3	Design simple robotic systems.
4	Apply programming in robotics.
5	Develop automation skills.

Course Outcomes:-

C01	Understand basic robotics concepts.
C02	Analyze components of robotic systems.
C03	Design simple robotic solutions.
C04	Implement basic robotic control.
C05	Apply robotics in real-world applications.

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes (3/2/1 indicates strength of correlation)											
							3-Strong, 2-Medium, 1-Weak					
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	2	2	--	3	--	--	--	--	--	--	1
C02	--	3	3	--	3	--	--	--	1	--	--	1
C03	--	--	3	2	3	--	--	--	2	--	--	1
C04	--	--	--	3	3	--	--	--	2	--	--	1
C05	--	--	--	--	2	--	--	--	2	--	2	3

Study / Practical Activities

1. Study of sensors and actuators
2. Simple robot design (line follower)
3. Microcontroller programming basics
4. Motor control experiment
5. Robotics simulation
6. Case study on industrial robots
7. Mini automation project
8. Robotics demonstration

SUBJECT CODE BTDS25AE408LD	SUBJECT Introduction to Quantum Computing	CREDITS 1
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Teaching Scheme	Examination Scheme
Theory: Tutorial : Practical: 2 hrs/ week	Continuous Assessment: 50 Marks Mid-Semester Exam: End Semester Exam: 50 Marks

Course Objectives:-

1	Understand principles of quantum computing.
2	Learn qubits and quantum gates.
3	Study quantum algorithms basics.
4	Analyze quantum computing applications.
5	Develop awareness of future computing paradigms.

Course Outcomes:-

C01	Understand quantum computing fundamentals.
C02	Analyze quantum operations and circuits.
C03	Apply basic quantum algorithms.
C04	Interpret quantum computing models.
C05	Explore advanced quantum applications.

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes											
	(3/2/1 indicates strength of correlation)						3-Strong, 2-Medium, 1-Weak					
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	3	--	--	2	--	--	--	--	--	--	1
C02	--	3	--	3	3	--	--	--	--	--	--	1
C03	--	--	2	--	3	--	--	--	--	--	--	1
C04	--	--	--	3	3	--	--	--	--	--	--	1
C05	--	--	--	--	2	--	--	--	--	--	--	3

Study / Practical Activities

1. Study of qubits and quantum states
2. Quantum gate operations simulation
3. Simple quantum circuit design
4. Case study on quantum algorithms
5. Quantum computing tools demo
6. Comparison with classical computing
7. Research assignment on applications
8. Mini project on quantum concepts

SUBJECT CODE BTDS25VSE409	SUBJECT Workshop / Skill Activity/ Course / Seminar	CREDITS 1
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Teaching Scheme	Examination Scheme
Theory: Tutorial : Practical: 2 hrs/ week	Continuous Assessment: 50 Marks Mid-Semester Exam: End Semester Exam: 50 Marks

Course Objectives:-

1	Understand emerging trends, tools, and technologies in data science through workshops and seminars.
2	Develop practical skills in data analysis, visualization, and machine learning techniques.
3	Enhance knowledge through expert lectures, certifications, and hands-on activities.
4	Apply learned concepts to solve real-world data-driven problems.
5	Improve communication, presentation, and lifelong learning abilities.

Course Outcomes:-

CO1	Demonstrate understanding of modern data science tools and technologies.
CO2	Apply acquired skills to analyze and interpret datasets.
CO3	Implement basic data science techniques in practical scenarios.
CO4	Present technical knowledge effectively through reports and seminars.
CO5	Engage in continuous learning through workshops, certifications, and seminars.

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes (3/2/1 indicates strength of correlation)											
	3-Strong, 2-Medium, 1-Weak											
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
CO1	2	3	--	--	3	--	--	--	--	--	2	3
CO2	3	3	2	--	3	--	--	--	--	--	2	3
CO3	2	2	2	2	3	--	--	--	--	--	2	2
CO4	--	--	1	--	2	--	--	--	2	3	--	2
CO5	--	--	--	--	1	--	--	--	--	--	1	3

Guidelines :

1. Students should participate in workshops, online courses, or seminars related to data science, AI, or analytics.
2. Hands-on practice must be included using tools such as Python, R, Excel, or visualization platforms.
3. Prepare a technical report or seminar presentation summarizing key learnings and applications.
4. Submit valid certificates or proof of participation along with a brief reflection on learning outcomes.

SUBJECT CODE BTDS25HM410	SUBJECT Universal Human Values-II	CREDITS 3
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Teaching Scheme	Examination Scheme
Theory: 3 Hrs. / Week Tutorial : Practical:	Continuous Assessment: 20 Marks Mid-Semester Exam: 20 End Semester Exam:60

Course Objectives:-

1	To understand the importance of value education in technical and professional life.
2	To develop self-awareness and harmony within oneself.
3	To promote harmony in family, society, and professional relationships.
4	To understand the interrelationship between human beings and nature.
5	To cultivate ethical responsibility and holistic vision in engineering practice.

Course Outcomes:-

C01	Understand the significance of Universal Human Values and self-exploration
C02	Develop harmony within self by understanding human aspirations and needs.
C03	Promote ethical and harmonious relationships in family and society.
C04	Recognize the importance of sustainable development and environmental responsibility.
C05	Apply ethical principles and holistic thinking in professional and personal life.

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes (3/2/1 indicates strength of correlation)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	–	–	1	–	–	2	1	2	1	1	–	2
C02	–	–	1	–	–	2	1	2	1	1	–	2
C03	–	–	2	–	–	3	1	3	2	2	1	2
C04	–	–	2	–	–	2	3	2	1	1	–	2
C05	–	–	2	–	–	3	2	3	2	2	1	3

COURSE CONTENTS**Unit I : Introduction to Value Education****(09 Hours)**

Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity, the Basic Human Aspirations, Right Understanding, Relationship and Physical Facility, Happiness and Prosperity, Current Scenario, Method to Fulfill the Basic Human Aspirations.

Unit II: Harmony in the Human Being (Self)**(09 Hours)**

Harmony in the Human Being: Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self,

Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to Ensure self-regulation and Health.

Unit III: Harmony in the Family and Society

(09 Hours)

Family as the basic unit of human interaction, Values in human-human relationships: Trust, Respect, Affection, Care, Guidance, Gratitude, Justice and equality in society, Mutual happiness and mutual prosperity, Social responsibility of engineers.

Unit IV: Harmony with Nature and Existence

(09 Hours)

Understanding nature as coexistence, Interconnectedness of human beings, society, and nature, Sustainable development, Ethical use of natural resources, Environmental responsibility of engineers, Role of technology in ecological balance.

Unit V: Holistic Vision of Life and Profession

(09 Hours)

Ethical responsibility in engineering profession, Value-based decision making, Professional ethics and social accountability, Holistic vision of life, Role of engineers in nation building, Case studies related to ethics and values.

Text Books:

1. **A Foundation Course in Human Values and Professional Ethics** – R. R. Gaur, R. Asthana, and G. P. Bagaria, Excel Books, New Delhi.
2. **Human Values** – A. N. Tripathi, New Age International Publishers.

Reference Books:

1. **Human Values and Professional Ethics** – M. K. Dixit, Vikas Publishing House.
2. **Value Education** – S. B. Lall & N. N. Tripathi, Vikas Publishing House.
3. **Ethics in Engineering** – Subhash Sharma, Galgotia Publications.
4. **Handbook on Universal Human Values** – AICTE.

SUBJECT CODE BTDS25HM411	SUBJECT Mini Project/ Case Study /EDP Programme / Start Up Activity	CREDITS 2
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Teaching Scheme	Examination Scheme
Theory: Tutorial : Practical: 4 hrs/ week	Continuous Assessment: 50 Marks Mid-Semester Exam: End Semester Exam:

Course Objectives:-

1	Apply data science concepts to design and develop solutions for real-world problems.
2	Analyze case studies and entrepreneurial ideas using data-driven approaches.
3	Develop skills in data collection, preprocessing, modeling, and interpretation.
4	Use modern tools and techniques for building data-driven applications or startup models.
5	Enhance teamwork, innovation, and project management abilities.

Course Outcomes:-

C01	Identify and define real-world problems suitable for data science solutions.
C02	Perform data preprocessing, analysis, and modeling on selected datasets.
C03	Design and implement a mini project or startup prototype using data science Techniques.
C04	Use modern tools for visualization, analysis, and reporting of results.
C05	Demonstrate teamwork, communication, and project management skills.

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes (3/2/1 indicates strength of correlation)											
	3-Strong, 2-Medium, 1-Weak											
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01	3	3	2	--	2	--	--	--	--	--	2	2
C02	3	3	--	3	3	--	--	--	--	--	2	--
C03	2	2	3	--	3	--	--	--	2	--	3	--
C04	--	2	--	3	3	--	--	--	--	--	2	--
C05	--	--	--	--	1	--	--	--	3	3	2	3

Guidelines :

1. Students should select a problem statement, case study, or startup idea and apply data science methods to solve it.
2. Use tools such as Python, R, Excel, or machine learning libraries for implementation and analysis.
3. Prepare a project report and presentation including methodology, dataset, results, and conclusions.
4. Work in teams to promote collaboration, innovation, and entrepreneurial thinking.

SUBJECT CODE BTDS25VEC412	SUBJECT Life of Shri Sant Gadge Baba	CREDITS AU
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Teaching Scheme	Examination Scheme
Theory: 1 Hrs. / Week Tutorial : Practical:	Continuous Assessment: Mid-Semester Exam: End Semester Exam:

Course Objectives:-

1	Understand the early life, background, and spiritual journey of Sant Gadge Baba
2	Explore his contributions to social reform, sanitation, and upliftment of marginalized communities
3	Analyze the philosophical and ethical principles guiding his actions and teachings
4	Appreciate his role in promoting cleanliness, education, and humanitarian values
5	Reflect on the relevance of his legacy in contemporary social and civic contexts

Course Outcomes:-

CO1	Describe the life events and spiritual evolution of Sant Gadge Baba
CO2	Identify his key contributions to social reform and public welfare
CO3	Interpret the ethical and philosophical foundations of his teachings
CO4	Evaluate the societal impact of his work and its historical significance.
CO5	Apply his values to current civic and educational initiatives

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak											
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
CO1	--	--	--	--	--	3	2	3	--	--	--	1
CO2	--	--	--	--	--	3	3	2	--	--	--	1
CO3	--	--	--	--	--	2	3	3	--	--	--	1
CO4	--	--	--	--	--	3	2	2	2	--	--	1
CO5	--	--	--	--	--	2	2	3	2	2	--	2

COURSE CONTENTS**Unit 1: Early Life and Background****[03 Hours]**

Birth and childhood in Shendgaon, Maharashtra
 Personal hardships and spiritual awakening
 Influence of Bhakti movement and saint traditions

Unit 2: Social Reform and Public Service**[03 Hours]**

Village sanitation campaigns and shramdaan (voluntary labor)
 Promotion of education, dharmashalas, and public welfare institutions
 Advocacy for equality and justice

Unit 3: Philosophical and Ethical Teachings**[03 Hours]**

Emphasis on service over rituals
 Ethical values: humility, compassion, and selflessness
 Kirtans and public discourses as tools for reform

Unit 4: Legacy and Impact**[03 Hours]**

Influence on leaders like Dr. B.R. Ambedkar
 Enduring inspiration for NGOs and civic movements
 Recognition by government and society

Unit 5: Contemporary Relevance**[03 Hours]**

Cleanliness drives and Swachh Bharat parallels
 Moral education and civic responsibility
 Integration of Gadge Baba's values in modern curricula

TEXT AND REFERENCE BOOKS:

1. Sant Gadge Baba. (2015). Pune: Government of Maharashtra, Directorate of Cultural Affairs.
2. Sant Gadge Baba: Vyakti ani Karya. (2012). Nagpur: Maharashtra Rajya Sahitya ani Sanskruti Mandal.
3. Gadge Baba: Samajik Krantiche Praneta. (2016). Amravati: Sant Gadge Baba Amravati University Press.
4. Samaj Sudharak Sant Gadge Baba. (2014). Mumbai: Popular Prakashan.
5. Saints of Maharashtra. (2010). New Delhi: National Book Trust, India.
6. Bhakti Movement in India. (2009). New Delhi: Oxford University Press.

SUBJECT CODE BTDS25VEC413	SUBJECT Moral and Ethical Development	CREDITS 1
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Teaching Scheme	Examination Scheme
Theory: 1 Hrs. / Week Tutorial : Practical:	Continuous Assessment: 50 Marks Mid-Semester Exam: End Semester Exam:

Course Objectives:-

1	To understand moral and ethical values in society.
2	To study democratic and secular principles.
3	To develop scientific thinking and reasoning.
4	To analyze ethical issues in social contexts.
5	To promote responsible behavior and decision-making.

Course Outcomes:-

CO1	Identify the importance of democratic, secular and scientific values in harmonious functioning of social life
CO2	Practice democratic and scientific values in both their personal and professional life.
CO3	Find rational solutions to social problems.
CO4	Be have in an ethical manner in society
CO5	Practice critical thinking and the pursuit of truth.

Mapping of Course Outcome with Program Outcomes

Course Outcome	Program Outcomes (3/2/1 indicates strength of correlation)											
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
CO1	--	--	--	--	--	3	--	3	--	--	--	1
CO2	--	--	--	--	--	3	--	3	2	--	--	1
CO3	--	--	--	--	--	2	--	3	2	--	--	1
CO4	--	--	--	--	--	3	2	2	2	--	--	1
CO5	--	--	--	--	--	2	--	3	2	2	--	2

COURSE CONTENTS**UNIT - I Democratic values****[03 Hours]**

Understanding Democratic values: Equality, Liberty, Fraternity, Freedom, Justice, Pluralism, Tolerance, Respect for All, Freedom of Expression, Citizen Participation in Governance – World Democracies: French Revolution, American Independence, Indian Freedom Movement.

UNIT - II Secular Values**[03 Hours]**

Understanding Secular values–Interpretation of secularism in Indian context -Disassociation

of state from religion – Acceptance of all faiths – Encouraging non-discriminatory practices.

UNIT – III Scientific Values

[03 Hours]

Scientific thinking and method: Inductive and Deductive thinking, Proposing and testing Hypothesis, Validating facts using evidence based approach – Skepticism and Empiricism – Rationalism and Scientific Temper.

UNIT – IV Social Ethics

[03 Hours]

Application of ethical reasoning to social problems –Gender bias and issues– Gender violence– Social discrimination – Constitutional protection and policies – Inclusive practices.

UNIT – V Scientific Ethics

[03 Hours]

Transparency and Fairness in scientific pursuits – Scientific inventions for the betterment of society - Unfair application of scientific inventions – Role and Responsibility of Scientist in the modern society

TEXT BOOK:

1. The Nonreligious: Understanding Secular People and Societies, LukeW.Galen Oxford University Press, 2016.
2. Secularism: A Dictionary of Atheism, Bullivant, Stephen; Lee, Lois, Oxford University Press, 2016.

REFERENCE BOOKS:

1. The Oxford Handbook of Secularism, JohnR.Shook, Oxford University Press,2017.
2. The Civic Culture: Political Attitudes and Democracy in Five Nations by Gabriel A. Almond and Sidney Verba, Princeton University Press,
3. Research Methodology for Natural Sciences by Soumitro Banerjee, IISc Press, January2022.

MULTIDISCIPLINARY COURSES COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE) [OFFERED TO OTHER DEPARTMENTS]											
Semester	Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				No. of Credits
				L	T	P	CA	MSE	ESE	Total	
III	MD	BTDS25MD304A	Java Programming	3	0	0	20	20	60	100	3
	MD	BTDS25MD304B	Introduction to Data Science	3	0	0	20	20	60	100	3
IV	MD	BTDS25MD404A	Analysis and Design of Algorithms	3	0	0	20	20	60	100	3
	MD	BTDS25MD404B	Computer Organization and Architecture	3	0	0	20	20	60	100	3
V	MD	BTDS25MD505A	Machine Learning	3	0	0	20	20	60	100	3
		BTDS25MD509AL	Machine Learning Laboratory	0	0	2	50	0	50	100	1
	MD	BTDS25MD505B	Cyber Security	3	0	0	20	20	60	100	3
		BTDS25MD509BL	Cyber Security Laboratory	0	0	2	50	0	50	100	1
VI	MD	BTDS25MD606A	Database Management System	2	0	0	20	20	60	100	2
	MD	BTDS25MD606B	Human Computer Interaction	2	0	0	20	20	60	100	2
VII	MD	BTDS25MD705A	Deep Learning	2	0	0	20	20	60	100	2
	MD	BTDS25MD705B	IOT and implementation in Industry	2	0	0	20	20	60	100	2

LIST OF COURSES

B.Tech Honors - COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

[Swayam / NPTEL]

Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				No. of Credits
			L	T	P	CA	MSE	ESE	Total	
HO	BTDS25H0333	Statistical Learning for Reliability Analysis https://onlinecourses.nptel.ac.in/noc22_cs120/preview	3	0	0	20	20	60	100	3
HO	BTDS25H0444	Artificial Intelligence: Search Methods for Problem Solving https://onlinecourses.nptel.ac.in/noc20_cs81/preview	3	0	0	20	20	60	100	3
HO	BTDS25H0555	Cloud Computing for Data Science https://onlinecourses.nptel.ac.in/noc21_cs14/preview	3	0	0	20	20	60	100	3
HO	BTDS25H0666	Algorithmic Graph Theory and Data Structures https://onlinecourses.nptel.ac.in/noc26_cs08/preview	3	0	0	20	20	60	100	3
HO	BTDS25H0777	Business Intelligence & Analytics https://onlinecourses.nptel.ac.in/noc24_cs65/preview	3	0	0	20	20	60	100	3
HO	BTDS25H0888	Software Project Management https://onlinecourses.nptel.ac.in/noc19_cs70/preview	3	0	0	20	20	60	100	3

ADDITIONAL CRITERIA FOR DOUBLE MINOR (SPECIALIZATION)

Category under NEP	Course Code	Course Title	Teaching Scheme			Evaluation Scheme			No. of Credits	
			L	T	P	CA	MSE	ESE	Total	
DMS	BTDS25DMS333	Data Structure and Algorithms	3	0	0	20	20	60	100	3
DMS	BTDS25DMS444	Analysis and Design of Algorithms	3	0	0	20	20	60	100	3
DMS	BTDS25DMS555	Software Testing and Quality Assurance	3	0	0	20	20	60	100	3
DMS	BTDS25DMS666	Data Analytics and Visualizations	3	0	0	20	20	60	100	3
DMS	BTDS25DMS777	Natural Language Processing	3	0	0	20	20	60	100	3
DMS	BTDS25DMS888	Big Data Analytics	3	0	0	20	20	60	100	3

ADDITIONAL CRITERIA FOR HONORS WITH RESEARCH

Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				No. of Credits
			L	T	P	CA	MSE	ESE	Total	
HR	BTME25HR777	Research Project Stage 1	--	--	18	--	--	100	100	9
HR	BTME25HR888	Research Project Stage 2	--	--	18	--	--	100	100	9

GUIDELINES FOR THE HONOUR WITH RESEARCH PROJECT

- ✚ The purpose of this course is to introduce students to the process of conducting research projects/work.
- ✚ The students will be helped to conceptualize, design and execute a research project by a guide/supervisor.

Research Project Stage-1:

- ✚ Learners will be encouraged to read books and research journals related to his/her research topic to do a literature review and identification of the problem.
- ✚ Research design/Methodology
- ✚ Data collection
- ✚ Data processing and analysis
- ✚ Publish a review paper in a journal
- ✚ At the end evaluated by two members of the department

Research Project Stage-2:

- ✚ Actual implementation
- ✚ Data Analysis and Interpretation
- ✚ Report writing & Presentation
- ✚ Publish a paper in a journal.
- ✚ The faculty supervisor will assess the findings.

At the end evaluated by two members of the department.