Evaluation Reforms NEP 2020

2nd Year Bachelor of Engineering

Information Technology

Shroff S R Rotary Institute of Chemical Technology,

Ankleshwar

EFFECTIVE FROM A.Y. 2026-2027

Teaching Scheme for

Second Year Bachelor of Information Technology

Semester-III (Information Technology) Structure

Course Code	Course	Teaching Scheme (hrs. / week)			Total	Credit	Examination Scheme				
		L	T	P	Hr	C	SEE	CCE	I/TW	V	Total
BUNBS311	Mathematics-III	3	1	0	4	4	50	50	25	25	150
BITPC301	Digital Logic Design	3	0	2	5	4	50	50	25	25	150
BCOPC302	Data Structure	3	0	2	5	4	50	50	25	25	150
BCOPC303	Database Management System	3	0	2	5	4	50	50	25	25	150
BUNAE321	English Proficiency Course	2	0	2	4	3	50	50	25	25	150
BUNVA331	Yoga for Well Being	0	0	4	4	2	0	0	25	25	50
	Total	14	1	12	27	21	250	250	150	150	800

Semester-IV (Information Technology) Structure

Course Code	Course	Teaching Scheme (hrs/week)			Total	Credit	Examination Scheme				
		L	T	P	Hr	C	SEE	CCE	I/TW	V	Total
BCOPC401	Discrete Mathematics	3	1	0	4	4	50	50	25	25	150
BCOPC402	Java Programming	3	0	2	5	4	50	50	25	25	150
BCOPC403	Artificial Intelligence	3	0	2	5	4	50	50	25	25	150
BCOVS404	Python Programming	0	0	2	2	1	0	0	25	25	50
BITPE401/ BCOPE406	Soft Computing / Internet of Things	2	0	2	4	3	50	50	25	25	150
BUNVA431	Universal Human Values	2	0	0	2	2	50	50	0	0	100
BXXOE441	Open Elective - 1	2	0	0	2	2	50	50	0	0	100
	Total	15	1	8	24	20	300	300	125	125	850

Multi-Disciplinary Minor Course

BXXMD451	Multi-Disciplinary Minor Course - 1	3	0	2	5	4	50	50	25	25	150

Open Elective - I (Semester – IV)

(Open Electives for Information Technology Students)

Sr.	Course Code	Course	Offered by
1	BMEOE441	Basics of Maintenance Engineering	Department of Mechanical Engineering
2	BEVOE441	Industrial Wastewater Treatment	Department of Environmental Science & Technology
3	BCHOE441	Introduction to Chemical Industry	Department of Chemical Engineering
4	BCOOE441	Emerging Technologies	Department of Computer Engineering
5	BCTOE441	Materials Engineering	Department of Chemical Technology
6	BEEOE441	Fundamentals of Renewable Energy Technologies	Department of Electrical Engineering

**Detailed syllabus separately available*

MDC - I (Semester – IV)

Multidisciplinary Minor Course (MDC-1) for Information Technology Students

Sr.	Course code	MDC-1 (Semester-4)	Minors	Offered by (department)
1	BMEMD451	Boiler and Steam Utility Systems	Mechanical Aspects of Process Utilities	Department of Mechanical Engineering
2	BEVMD451	Introduction to Environmental	Environmental Management	Department of Environmental Science & Technology
3	BCHMD451	Introduction to Industrial Safety	Industrial Safety	Department of Chemical Engineering
4	BCOMD451	Fundamentals of Data Science	Data Science	Department of Computer Engineering
5	BEEMD451	Basics of Measuring Instruments	Industrial Instrumentation and Automation	Department of Electrical Engineering
6	BPTMD451	Fundamentals of Pharmaceutical	Pharmaceutical Engineering	Department of Pharmaceutical Technology
7	BGCMD451	Fundamentals of Materials Science and Engineering	Ceramics Engineering	Department of Glass & Ceramics Technology
8	BDPMD451	Introduction to Paint and Coating Technology	Paint Technology	Department of Dyes & Pigments Technology
9	BPRMD451	Chemistry of Polymers	Polymer Science and Engineering	Department of Polymer & Rubber Technology

**Detailed syllabus separately available*

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B.E. Semester III

Mathematics –III (BUNBS311)

Teaching Scheme (Hrs./week)				Credit	Examination Scheme				
L	T	P	Total		SEE	CCE	I/TW	V	Total
3	1	0	4	4	50	50	25	25	150

PREREQUISITE:

Students should have basic knowledge of calculus, including limits, continuity, differentiation, and integration. Understanding trigonometric functions and identities is essential. Familiarity with differential equations, coordinate geometry (Cartesian and polar), functions, graphs, and algebraic manipulation is required to effectively learn Fourier series, Laplace transforms, and double integrals.

COURSE CONTENT

Sr. No.	Topics	COs	Hrs (45)
	SECTION-A		
1	**Fourier Series:** Periodic function, Trigonometric series, Fourier series, Functions of any period, Even and odd functions, Half-range Expansion.	**1**	**7**
2	**Fourier integral:** Sine and cosine integral, even and odd functions	**2**	**6**
3	**Laplace Transforms**: Definition of the Laplace transform, Linearity, shifting theorems, Laplace transformation of elementary function, basic properties of Laplace transformation, Differentiation of Laplace transformation (multiplication by t), Integration of Laplace transformation (division by t), Laplace transformation of derivatives and integrals, Evaluation of integrals using Laplace transformation.	**4**	**10**
	SECTION-B		
4	**Inverse Laplace transformation and its application:** Properties of inverse Laplace transformation, shifting theorem, multiplication and division by differentiation and integration of Laplace transformation. Convolution theorem, inverse Laplace transformation using partial fraction, solution of linear differential equation.	**5**	**10**
5	**Double integral and its applications :** over rectangular and general regions, properties of double integrals, Change of order, change of variables, Area by double Integrals.	**6**	**7**
6	**Curve Sketching**: Curve sketching in Cartesian Co-ordinates and Polar co-ordinates, Relation between Polar and Cartesian Co-ordinates.	**3**	**5**

LIST OF TUTORIALS

1. Tutorial-1 (Fourier Series)

2. Tutorial-2 (Fourier Series)
3. Tutorial-3 (Fourier Integral)
4. Tutorial-4 (Laplace Transform)
5. Tutorial-5 (Laplace Transform)
6. Tutorial-6 (Inverse Laplace Transformation)
7. Tutorial-7 (Inverse Laplace Transformation)
8. Tutorial-8 (Double Integral and its application)
9. Tutorial-9 (Double Integral and its application)
10. Tutorial-10 (Curve sketching)

TEXT BOOKS:

1. Advanced Engineering Mathematics by Ravish Singh and Mukul Bhatt.MC Graw Hill Education Pvt Ltd.
2. Engineering Mathematics Vol 2, by Baburam, Pearson

REFERENCE BOOKS:

1. Thomas' Calculus, Maurice D. Weir, Joel Hass, Frank R. Giordano, Pearson Education.
2. Advanced Engineering Mathematics (8th Edition), by E. Kreyszig, Wiley- India (2007)..
3. R. V. Churchill and J. W. Brown, Fourier series and boundary value problems (7th Edition), McGraw-Hill (2006).

ONLINE RESOURCES:

- https://digimat.in/nptel/courses/video/111105134/L36.html
- http://www.digimat.in/nptel/courses/video/122104017/L12.html
- https://www.digimat.in/nptel/courses/video/111105123/111105123.html

COURSE OUTCOMES

CO1	**Define** Fourier series, periodic functions, trigonometric series, and perform half-range expansions for even and odd functions.
CO2	**Solve** problems involving Fourier sine and cosine integrals, including applications to even and odd functions.
CO3	**Sketch** curves in Cartesian.
CO4	**Calculate** Laplace transforms of functions using properties, shifting theorems, and apply them to evaluate integrals.
CO5	**Calculate** inverse Laplace transforms and solve linear differential equations using properties, convolution theorem, and partial fractions.
CO6	**Construct** and evaluate double integrals over different regions, including change of order and change of variables.

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B.E. Semester III

Digital Logic Design (BITPC301)

Teaching Scheme (Hrs./week)				Credit	Examination Scheme				
L	T	P	Total		SEE	CCE	I/TW	V	Total
3	0	2	5	4	50	50	25	25	150

PREREQUSITE:

Basic understanding of mathematics (number systems and Boolean algebra) for analyzing digital circuits. Students should have foundational knowledge of basic electronics concepts (voltage, current, logic gates) and problem-solving skills for circuit analysis and design.

COURSE CONTENT:

Sr. No.	Topics	COs	Hrs (45)
	SECTION-A		
1	**Digital Data Representation & Computer Arithmetic:** Number system conversions, Fixed-point and floating-point representation (basic idea), binary arithmetic Signed number representation (1's & 2's complement, Overflow and underflow concept, Binary arithmetic logic Operation. Codes: BCD, Excess-3, Gray Code, Character encoding: ASCII & Unicode in information systems	1	7
2	**Boolean Logic & Logic Optimization Techniques:** Boolean algebra laws, SOP & POS forms, Logic minimization using: K-Map (2,3,4 variables) Logic Gates (AND, OR, NOT, NAND, NOR, XOR) , Logic realization using NAND/NOR only.	2	8
3	**Combinational Logic Design**: Combinational Digital Circuits: Half & Full Adder, 4-bit Parallel Adder, carry look ahead adder, serial adder, ALU Multiplexer & Demultiplexer, Encoder & Decoder, Comparator and Code Converters.	3	8
	SECTION-B		
4	**Sequential Circuit Analysis:** Difference: Combinational vs Sequential Circuits, 1-bit memory, Flip-Flip-Flops: SR Flip-Flop, JK Flip-Flop, D Flip-Flop, T Flip-Flop, Truth tables & characteristic equations. State table & state diagram, State reduction & assignment.	4	7
5	**Registers & Counters and Finite state Machines (FSM):** Shift Registers: SISO, SIPO, PISO, PIPO, Synchronous Counter design, FSM design for traffic controller and pattern detector, Introduction to HDL-based FSM modelling	5	7
6	**Memory and Programmable logic Devices:**	6	8

	Memory hierarchy overview (Cache, RAM, and ROM – concept only), Semiconductor memories (SRAM vs DRAM), Introduction to: PAL, PLA, FPGA (conceptual architecture), Basics of Verilog/VHDL structure (module, input, output – conceptual), and Digital system implementation using programmable logic. Overview of ADC/DAC in data acquisition systems.		

LIST OF PRACTICALS:

1. Practical on Number System Conversion/Study of Digital Codes
2. Practical on Study of Logic Gates.
3. Practical on Verification of Universal Gates.
4. Practical on Implementation of Boolean Functions / Minimization using K-Map
5. Practical on Multiplexer and Demultiplexer.
6. Practical on Encoder and Decoder.
7. Practical on Study of Flip-Flops.
8. Practical on Shift Registers and counters.
9. Practical on Mealy or Moore FSM for pattern detection or control application
10. Practical on Introduction to HDL

TEXT BOOKS:

1. M. Morris Mano & Michael D. Ciletti, Digital Design, Pearson Education.
2. Stephen Brown & Zvonko Vranesic, Fundamentals of Digital Logic with Verilog Design, McGraw-Hill Education.

REFERENCE BOOKS:

1. A. Anand Kumar, Fundamentals of Digital Circuits, PHI Learning.
2. M. Morris Mano, Digital Logic and Computer Design, Pearson Education.
3. Brian Holdsworth & Clive Woods, Digital Logic Design, Newnes.
4. William Kleitz, Digital Electronics: A Practical Approach with VHDL, Prentice Hall.

ONLINE RESOURCES:

1. https://www.kaggle.com
2. https://pandas.pydata.org
3. https://scikit-learn.org
4. https://colab.research.google.com
5. https://data.gov.in

COURSE OUTCOMES:

CO1	**Apply** number systems, computer arithmetic, and data representation for information processing.
CO2	**Analyse** Boolean expressions using K-map and logic minimization techniques.
CO3	**Design** combinational logic circuits such as ALU, multiplexers, encoders, and comparators.

CO4	**Describe** sequential circuits using flip-flops, state tables, and diagrams.
CO5	**Implement** FSMs, counters, and registers for digital applications.
CO6	**Evaluate** memory systems and programmable logic devices (PAL, PLA, FPGA) for modern digital systems.

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Shroff S R Rotary Institute of Chemical Technology

B.E. Semester III

Data Structure (BCOPC302)

Teaching Scheme (Hrs./week)				Credit	Examination Scheme				
L	T	P	Total		SEE	CCE	I/TW	V	Total
3	0	2	5	4	50	50	25	25	150

PREREQUSITE:
Students should have basic knowledge of programming in C/C++ or Python, including variables, control structures (loops, conditionals), and functions. Understanding of arrays, pointers and basic problem-solving techniques is essential. Familiarity with recursion and basic mathematical concepts.

COURSE CONTENT:

Sr. No.	Topics	COs	Hrs (45)
	SECTION-A		
1	**Introduction to Data Structure :** Introduction to Data Structure, Types of Data Structure, Classification of Data Structure, Operations on Data Structure, Memory Allocation, Algorithm and Complexity, Abstract Data Type, Applications of Data Structure.	1	06
2	**Stacks:** Introduction to Stack, Stack Operations (Push, Pop and Peek), Array Representation of Stack, Linked List Representation of Stack, Applications of Stack, Expression Conversion and Evaluation, Recursion and Stack.	2	08
3	**Queues:** Introduction to Queue, Queue Operations (Enqueue, Dequeue), Array Representation of Queue, Linked List Representation of Queue, Types of Queues, Circular Queue, Priority Queue, Applications of Queue.	3	07
	SECTION-B		
4	**Linear Lists:** Introduction to Linear List, Sequential Representation using Array, Operations on Linear List, Linked List, Types of Linked List, Operations on Linked List, Applications of Linear List.	4	07
5	**Sorting and Searching:** Introduction to Sorting and Searching, Simple Sorting Techniques (Bubble, Selection, Insertion), Advanced Sorting Techniques (Merge, Quick, Heap, Shell, Radix), Comparison of Sorting Methods, Searching Techniques (Linear Search, Binary Search), Hashing, Complexity Analysis.	5	08

6	**Tree & Graphs:** Introduction to Trees, Binary Tree and Types, Tree Traversal Techniques, Binary Search Tree, Heap and Balanced Trees, Introduction to Graphs, Graph Representation, Graph Traversal (BFS, DFS), Minimum Spanning Tree, Shortest Path Algorithms, Applications of Trees and Graphs.	**6**	**09**

LIST OF PRACTICALS:

1. Write a program to perform operations on Array:
    a) Traversal
    b) Insertion
    c) Deletion
    d) Searching
2. Write a program to implement Stack using Array and perform Push, Pop and Peek operations.
3. Write a program to implement Stack using Linked List and perform expression conversion:
    a) Infix to Postfix
    b) Postfix Evaluation
4. Write a program to implement Queue using Array and perform Enqueue and Dequeue operations.
5. Write a program to implement Circular Queue and Priority Queue.
6. Write a program to implement Singly Linked List with following operations:
    a) Creation
    b) Insertion (Beginning, End, Position)
    c) Deletion
    d) Traversal
7. Write a program to implement Doubly Linked List and Circular Linked List operations.
8. Write a program to implement Sorting Techniques:
    a) Bubble Sort
    b) Selection Sort
    c) Insertion Sort
    d) Quick Sort / Merge Sort
9. Write a program to implement Searching Techniques:
    a) Linear Search
    b) Binary Search
    c) Hashing (Simple Hash Table)
10. Write a program to implement Binary Search Tree and perform:
    a) Insertion
    b) Deletion
    c) Traversal (Inorder, Preorder, Postorder)

TEXT BOOKS:

1. M. Tanenbaum, Data Structures Using C, Tata McGraw Hill.
2. Reema Thareja, Data Structures Using C, Oxford University Press.
3. Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures, Computer Science

Press.

REFERENCE BOOKS:

1. Thomas H. Cormen, Introduction to Algorithms, MIT Press.
2. Narasimha Karumanchi, Data Structures and Algorithms Made Easy, CareerMonk Publications.
3. Robert Sedgewick, Algorithms, Addison-Wesley.

ONLINE RESOURCES:

1. https://www.geeksforgeeks.org/data-structures/
2. https://www.tutorialspoint.com/data_structures_algorithms/
3. https://www.programiz.com/dsa
4. https://nptel.ac.in/courses/computer-science-and-engineering/

COURSE OUTCOMES:

CO1	**Explain** fundamental concepts of data structures, algorithms, memory allocation, and abstract data types.
CO2	**Apply** stack data structures to solve problems such as expression evaluation and recursion.
CO3	**Implement** various queue structures including linear, circular, and priority queues.
CO4	**Demonstrate** operations on linear data structures using arrays and linked lists.
CO5	**Analyze** sorting and searching algorithms, including hashing techniques and computational complexity.
CO6	**Evaluate** tree and graph data structures by performing traversals and applying graph algorithms.

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Shroff S R Rotary Institute of Chemical Technology

B.E. Semester III

Database Management System (BCOPC303)

Teaching Scheme (Hrs./week)				Credit	Examination Scheme				
L	T	P	Total		SEE	CCE	I/TW	V	Total
3	0	2	5	4	50	50	25	25	150

PREREQUISITE:

A basic understanding of computer fundamentals, including hardware, software, and file systems, is required before studying Database Management Systems. Students should also be familiar with programming concepts such as variables, control structures, and functions. Knowledge of basic data structures and logical reasoning further supports effective understanding of database concepts.

COURSE CONTENT:

Sr. No.	Topics	COs	Hrs (45)
	SECTION-A		
1	**Basics of DBMS:** Introduction & applications of DBMS, File system vs DBMS, Purpose of database, Data & Database concepts, Data independence, Database architecture (3-level), Users & DBA.	1	7
2	**Relational Model & ER Model:** Structure of relational databases, Domains, Relations, Relational algebra (operators & queries), Tuple relational calculus, ER model concepts, Keys & constraints, ER diagrams, Weak entities, Generalization, Specialization, Aggregation.	2	8
3	**SQL Concepts:** SQL basics (DDL, DML, DCL), Table creation & alteration, Constraints (PK, FK, Unique, Not null, Check), Insert, Update, Delete, Select queries, Joins, Subqueries, Group By, Having, Order By, Views, Functions, Transaction commands.	3	8
	SECTION-B		
4	**Database Design & Normalization:** Functional Dependency, Closure of FD & attributes, Irreducible FD, Normalization, Decomposition, Dependency preservation.	4	7
5	**Transaction Management & Query Processing:** Transaction concepts, ACID properties, Serializability, Concurrency control, Locking mechanisms, Deadlock handling, Two-phase locking, Recovery techniques, Two-phase commit, Query processing, Query optimization.	5	8

6	**Security & PL/SQL Concepts:** Security concepts, Discretionary & Mandatory access control, Data encryption, Cursors, Stored procedures, Stored functions, Triggers.	**6**	**7**

LIST OF PRACTICALS:

1. Create database and tables using DDL commands.
2. Perform ALTER and DROP operations on tables.
3. Implement INSERT, UPDATE, and DELETE queries.
4. Write SELECT queries with conditions and generate reports.
5. Implement SQL functions (aggregate, string, date).
6. Use GROUP BY and HAVING clause.
7. Perform JOIN operations (inner, outer, self-join).
8. Implement subqueries and correlated queries.
9. Use transaction control commands (Commit, Rollback, Savepoint).
10. Develop PL/SQL programs using cursor, procedure, and triggers.

TEXT BOOKS:

1. Abraham Silberschatz, Henry F. Korth & S. Sudarshan, Database System Concepts, McGraw-Hill.
2. Ivan Bayross, SQL, PL/SQL: The Programming Language of Oracle, BPB Publications.

REFERENCE BOOKS:

1. C. J. Date, An Introduction to Database Systems, Pearson.
2. George Koch, Oracle: The Complete Reference, McGraw-Hill.

ONLINE RESOURCES:

1. https://vlabs.iitb.ac.in
2. https://nptel.ac.in/courses/106102064
3. https://www.coursera.org

COURSE OUTCOMES:

CO1	**Understand** DBMS concepts and architecture.
CO2	**Apply** relational model and ER design.
CO3	**Develop** SQL queries for database operations.
CO4	**Design** normalized databases.
CO5	**Analyze** transaction management and query optimization.
CO6	**Implement** PL/SQL and database security.

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B.E. Semester III

English Proficiency Course (BUNAE321)

Teaching Scheme (Hrs./week)				Credit	Examination Scheme				
L	T	P	Total		SEE	CCE	I/TW	V	Total
2	0	2	4	3	50	50	25	25	150

PREREQUISITE:

Students should have basic communication skills in English, including reading, writing, and speaking. Familiarity with grammar, vocabulary, and sentence structure is important. Awareness of interpersonal communication and professional behavior is helpful. Willingness to participate in discussions and presentations, along with interest in self-development and effective communication, will support learning outcomes.

COURSE CONTENT

Sr. No.	Topics	COs	Hrs (30)
	SECTION-A		
1	**Dynamics of Communication:** Definition and process Kinesics Proxemics Paralinguistic features Importance of Interpersonal and Intercultural Communication in today's organizations	1	6
2	**Technical Writing:** Report writing Technical proposal Technical description Business letters(sales, order, complaint, adjustment, inquiry, recommendation, appreciation, apology, acknowledgement, cover letter) Agenda of meeting, Minutes of meeting, Resume writing	2	4
3	**Technical Communication:** Public speaking, Group discussion, Presentation strategies, Interview skills, Negotiation skills ,Critical and Creative thinking in communication	3	5
	SECTION-B		
4	**Ethics in Engineering:** Scope of engineering ethics, Accepting and sharing responsibility , Resolving ethical dilemmas, Making moral choices	4	4
5	**Etiquettes**: Telephone etiquettes, Etiquettes for foreign business trips, Etiquettes for small talks, Respecting privacy, Learning to say NO, Time management.	5	5
6	**Self-development and Assessment:** Change, Grow, Persist, Prioritize, Read, Learn, Listen, Record, Remember, Asses, Think, Communicate, Relate, Dream	6	6

LIST OF PRACTICALS:

1. Role Play
2. Letter Writing
3. Group Discussion
4. Presentation

5. Book Review (Preferably related to self- development)
6. Mock Interview
7. Report Writing
8. Case studies related to unit 4, 5 and 6
9. Conducting meeting with Agenda
10. Minutes of the Meeting

TEXT BOOKS:

1. Raman and Sharma, Technical Communications, OUP, New Delhi, 2017

REFERENCE BOOKS:

1. Lata and Kumar, Communication Skills, OUP, New Delhi, 2018

2. Mike Martin and Roland Schinzinger, Ethics in Engineering, McGraw Hill, New York, 2014

3. Mohapatra and Sreejesh S., Case Studies in Business Ethics and Corporate Governance, Pearson, UP, 2013

4. Ramesh and Ramesh, The Ace of Soft Skills, Pearson, UP, 2019

5. Sherfield, Montgomery and Moody, Cornerstone: Developing Soft Skills, UP, 2009

ONLINE RESOURCES:

- https://www.scu.edu/ethics/focus-areas/more/engineering-ethics/engineering-ethics-cases

COURSE OUTCOMES

CO1	**Define** and describe dynamics of verbal and non-verbal aspects of communication.
CO2	**Associate** with various formal documents of technical and professional communication
CO3	**Interpret** communication of diverse formal situations taking place in organizations.
CO4	**Illustrate** and examine the knowledge of ethical aspects of engineering
CO5	**Establish** and explain social and professional etiquettes.
CO6	**Recommend** self -development and self - assessment.

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Shroff S R Rotary Institute of Chemical Technology

B.E. Semester III

Yoga for Well-Being (BUNVA331)

Teaching Scheme (Hrs./week)				Credit	Examination Scheme				
L	T	P	Total		SEE	CCE	I/TW	V	Total
0	0	4	4	2	00	00	25	25	50

PREREQUISITE:

No prior yoga experience is required; the course is open to all interested in improving physical, mental, and emotional well-being. Participants should be medically fit for moderate activity, and those with existing health conditions must consult a doctor and inform the instructor in advance. Regular attendance, discipline, and willingness to learn are essential.

COURSE CONTENT:

Sr. No.	Topics	COs	Hrs (60)
1	**Yoga and Asana** • Meaning, Definition and Importance of Yoga • Meaning, Definition and Importance of Asana • Asanas for Prevention of Lifestyle Diseases	1	20
2	**Pranayama and Body Balance** • Meaning, Definition and Importance of Pranayama • Various Types of Pranayama • Importance of Pranayama for Balanced Body and Mind	2	20
3	**Yoga Meditation and Stress Management** • Meaning, Definition and Importance of Yoga Meditation • Basic Meditation Techniques • Stress Management through Yoga	3	20

LIST OF PRACTICALS:

1. Performance and viva of minimum 1-topic including explanation of benefits.
2. Demonstration of skills, techniques, and basic rules of any 5 selected Asana.
3. Any one of the Topic as specialization.
4. Asana Practical.

TEXT BOOKS:

1. Yoga Education – NCERT (National Council of Educational Research and Training)
2. Common Yoga Protocol – Ministry of AYUSH, Government of India
3. Yoga for Healthy Living – Swami Ramdev / Baba Ramdev's Yoga Textbook

REFERENCE BOOKS:

1. The Heart of Yoga – T.K.V. Desikachar
2. Yoga for Wellness – Yoga Journal Books
3. Light on Yoga – B.K.S. Iyengar
4. Yoga: Its Meaning, Theory and Practice – Swami Digambarji

ONLINE RESOURCES:

1. https://www.ayush.gov.in/
2. https://svyasa.edu.in/
3. https://www.artofliving.org/
4. https://nimhans.ac.in/

COURSE OUTCOMES:

CO1	**Understand** the fundamentals of Yoga, Asanas, Pranayama, and Meditation for holistic health and mental well-being.
CO2	**Develop** practical skills to perform Asanas and Pranayama with correct posture and breathing.
CO3	**Apply** yogic practices for improving fitness, managing stress, and preventing lifestyle-related diseases.
CO4	**Build** self-discipline through log-book and project work, and track personal health and fitness progress.

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Shroff S R Rotary Institute of Chemical Technology

B.E. Semester IV

Discrete Mathematics (BCOPC401)

Teaching Scheme (Hrs./week)				Credit	Examination Scheme				
L	T	P	Total		SEE	CCE	I/TW	V	Total
3	1	0	4	4	50	50	25	25	150

PREREQUISITE:

Students should have a basic understanding of mathematics, including algebra and arithmetic operations. Familiarity with sets, functions, and graphs is helpful. Logical thinking and problem-solving skills are essential for topics like logic, relations, and algebraic structures. Basic knowledge of statistics and probability also supports learning; no advanced background is required.

COURSE CONTENT:

Sr. No.	Topics	COs	Hrs (45)
	SECTION-A		
1	**Set Theory:** Basic Concepts of Set Theory: Definitions, Inclusion, Equality of Sets, Cartesian product, The Power Set, Some operations on Sets, Venn Diagrams, Some Basic Set Identities **Functions:** Introduction & definition, Co-domain, range, image, value of a function; Examples, surjective, injective, bijective; examples; Composition of functions, examples; Inverse function, Identity map, condition of a function to be invertible, examples; Inverse of composite functions, Properties of Composition of functions	1	8
2	**Propositional Logic:** Definition, Statements & Notation, Truth Values, Connectives, Statement Formulas & Truth Tables, Well-formed Formulas, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Examples. **Predicate Logic:** Definition of Predicates; Statement functions, Variables, Quantifiers, Predicate Formulas, Free & Bound Variables; The Universe of Discourse, Examples, Valid Formulas & Equivalences, Examples.	2	7
3	**Relations:** Definition, Binary Relation, Representation, Domain, Range, Universal Relation, Void Relation, Union, Intersection, and Complement Operations on Relations, Properties of Binary Relations in a Set: Reflexive, Symmetric, Transitive, Anti-symmetric Relations, Relation Matrix and Graph of a Relation, Equivalence Relation, Equivalence Classes, Composite Relation.	3	7
	SECTION-B		

4	**Algebraic Structures**: Algebraic structures with one binary operation Semigroup, Monoid, Group, Subgroup, normal subgroup, group Permutations, Coset, homomorphic subgroups, Lagrange's theorem, Congruence relation and quotient structures. Algebraic structures (Definitions and simple examples only) with two binary operation- Ring, Integral domain and field	4	7
5	**Basics of Statistics**: Elements, Variables, Observations, Quantitative and Qualitative data, Corss-sectional and Time series data, Frequency distribution, Dot plot, Histogram, Cumulative distribution, Measure of location, Mean, Median, Mode, Percentile, Quartile, Measure of variability, Range, Interquartile Range, Variance, Standard Deviation, Coefficient of Variation, Regression Analysis, Regression line and regression coefficient,	5	9
6	**Probability Distribution**: Introduction, Conditional probability, Independent events, Independent experiments, Theorem of total probability and Bayes' theorem, Probability distribution, Binomial distribution, Poisson distribution, Uniform distribution, Normal distribution	6	7

LIST OF TUTORIALS:

1. Tutorial-1 (Set Theory)
2. Tutorial-2 (Functions)
3. Tutorial-3 (Propositional Logic)
4. Tutorial-4 (Predicate Logic)
5. Tutorial-5 (Relations)
6. Tutorial-6 (Relations)
7. Tutorial-7 (Algebraic Structures)
8. Tutorial-8 (Basics of Statistics)
9. Tutorial-9 (Probability Distribution)
10. Tutorial-10 (Assignment)

TEXT BOOKS:

1. Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and R. Manohar, Tata McGraw-Hill,1997

REFERENCE BOOKS:

1. S. Lipschutz and M. L. Lipson, Schaum's Outline of Theory and Problems of Discrete Mathematics, 2nd Ed., Tata McGraw-Hill,1999.
2. K. H. Rosen, Discrete Mathematics and its applications, Tata McGraw-Hill, 6th Ed., 2007.
3. David Liben-Nowell, Discrete Mathematics for Computer Science, Wiley publication, July 2017.
4. P. G. Hoel, S. C. Port and C. J. Stone, "Introduction to Probability Theory", Universal Book Stall, 2003.
5. T. Veerarajan, Probability, Statistics and Random Processes, Third edition, Tata McGraw- Hill, New Delhi, 2010.

ONLINE RESOURCES:

- https://nptel.ac.in/courses/106108227
- http://digimat.in/nptel/courses/video/106106094/L01.html

COURSE OUTCOMES:

CO1	**Define** and apply concepts of set theory and functions, including operations on sets, types of functions, composition, and inverse functions.
CO2	**Solve** logical problems using propositional and predicate logic, including truth tables, quantifiers, and logical equivalences.
CO3	**Analyze** and represent relations, and evaluate their properties such as reflexivity, symmetry, transitivity, and equivalence relations.
CO4	**Evaluate** algebraic structures such as groups, subgroups, rings, and fields, and apply related theorems and properties.
CO5	**Calculate** statistical measures including mean, median, variance, standard deviation, and apply regression analysis.
CO6	**Construct** and evaluate probability models using conditional probability, Bayes' theorem, and standard distributions.

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Shroff S R Rotary Institute of Chemical Technology

B.E. Semester IV

Java Programming (BCOPC402)

Teaching Scheme (Hrs./week)				Credit	Examination Scheme				
L	T	P	Total		SEE	CCE	I/TW	V	Total
3	0	2	5	4	50	50	25	25	150

PREREQUISITE:

Basic knowledge of computer fundamentals and understanding of programming concepts such as data types, variables, operators, and control structures is recommended, along with familiarity with object-oriented concepts and simple program execution.

COURSE CONTENT:

Sr. No.	Topics	COs	Hrs (45)
	Section-A		
1	**Introduction to Java:** Basics of Java, Java Virtual Machine & Byte Code, Java Environment Setup, Java Program Structure, Procedure-Oriented vs Object-Oriented Programming, Basics of Object-Oriented Programming - Abstraction, Encapsulation, Inheritance, Classes, Subclasses, and Super classes, Polymorphism.	1	07
2	**Building Blocks of the Language:** Data Types (primitive and non-primitive), Constants, and Variables, Arrays and String Handling, Operators in Java, Decision & Control Structures.	2	08
3	**Object Oriented Programming Concepts:** Defining classes, fields and methods, creating objects, accessing rules, this keyword, static keyword, method overloading, final keyword, Constructors: Default constructors, Parameterized constructors, Copy constructors, Passing object as a parameter, constructor overloading.	3	08
	Section- B		
4	**Inheritance, Packages & Interfaces:** Basics of Inheritance, Types of inheritance, concepts of method overriding, Packages in Java, Interfaces in Java, Abstract and Final Classes.	4	07
5	**Exception Handling:** Types of errors and exceptions, Exception hierarchy, try, catch, finally blocks, throw and throws keywords, Custom exceptions.	5	08

	Multithreaded Programming: Concept of threads, Thread lifecycle, Creating threads - Thread class & Runnable interface, Synchronization, Inter-thread communication.		
6	**File Handling:** File and stream concepts, Byte streams and character streams, FileInputStream, FileOutputStream, BufferReader, BufferWriter Reading and writing files, Serialization and deserialization.	**6**	**07**

LIST OF PRACTICALS:

1. Write a program to display "Hello World" and demonstrate the basic structure of a Java program.
2. Write a program to demonstrate the use of data types, variables, and constants in Java.
3. Write a program to perform operations on arrays (such as finding sum, average, and largest element).
4. Write a program to demonstrate string handling functions (length, substring, concatenation, comparison).
5. Write a program to implement different operators (arithmetic, relational, logical) in Java.
6. Write a program using decision-making statements (if-else, switch) and looping constructs (for, while).
7. Write a program to demonstrate classes and objects, including use of methods and constructors.
8. Write a program to demonstrate inheritance and method overriding.
9. Write a program to implement exception handling using try, catch, and finally blocks.
10. Write a program to demonstrate file handling (reading and writing data to a file).

TEXT BOOKS:

1. Herbert Schildt Java: The Complete Reference, Seventh Edition Tata McGraw Hill.
2. E Balagurusamy, Programming with Java, Tata McGraw Hill.
3. Sachin Malhotra & Saurabh Choudhary, Programming in JAVA, Oxford.

REFERENCE BOOKS:

1. Cay S. Horstmann, Core Java Volume I – Fundamental, Prentice Hall.
2. Bruce Eckel, Thinking in Java, Prentice Hall.
3. Joshua Bloch, Effective Java, Addison-Wesley.

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/106105191/
2. https://docs.oracle.com/javase/
3. https://www.coursera.org/

COURSE OUTCOMES:

CO1	**Remember** basics of Java and OOP concepts.

CO2	**Understand** data types and control structures.
CO3	**Apply** classes and objects in program development.
CO4	**Analyze** inheritance, packages, and interfaces.
CO5	**Evaluate** exception handling and multithreading concepts.
CO6	**Create** programs using file handling operations.

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B.E. Semester IV

Artificial Intelligence (BCOPC403)

Teaching Scheme (Hrs./week)				Credit	Examination Scheme				
L	T	P	Total		SEE	CCE	I/TW	V	Total
3	0	2	5	4	50	50	25	25	150

PREREQUSITE:

A strong foundation in mathematics, especially linear algebra, probability, and statistics, is essential. Basic programming knowledge in languages like Python, Java, or C++ is required. Understanding of algorithms, data structures, and problem-solving techniques is important. Familiarity with concepts of machine learning and logical reasoning will be an added advantage.

COURSE CONTENT:

Sr. No.	Topics	COs	Hrs (45)
	SECTION-A		
1	**Introduction to AI & Production Systems:** Intelligent Agents, AI Techniques, AI Problem Formulation, AI Applications, Control Strategies, Production Systems, Components, Types, Production Characteristics, Issues in Design of Search Programs	1	8
2	**Problem Solving & State Space Search:** Problems, State Space Representation, Problem Graphs, Generate-and-Test, BFS, DFS, Blind Search Techniques	2	7
3	**Heuristic & Advanced Search Techniques:** Heuristic Search, Hill Climbing, Best-First Search, A*, AO*, Problem Reduction, Means-Ends Analysis, Constraint Satisfaction, Constraint Propagation, Neural, Stochastic & Evolutionary Algorithms, Performance Analysis	3	8
	SECTION-B		
4	**Knowledge Representation:** Representations & Mappings, Predicate Logic, ISA Relationships, Resolution, Procedural vs Declarative Knowledge, Logic Programming, Forward & Backward Reasoning	4	7
5	**Natural Language Processing & Game Playing:** NLP - Syntactic, Semantic, Discourse, Pragmatics, Spell Checking; Game Playing - Minimax, Alpha-Beta Pruning, Iterative Deepening	5	7
6	**Knowledge Inference & Reasoning:** Production & Frame-Based Systems, Forward & Backward Chaining, Fuzzy Logic, Certainty Factors, Bayesian Networks, Dempster-Shafer	6	8

	Theory, Non-Monotonic Reasoning, Markov Networks		

LIST OF PRACTICALS:

1. Implement 8-puzzle problem or Water Jug problem using state space search.
2. Implement basic search strategies (Breadth First Search, Depth First Search).
3. Implement uninformed search technique (Generate-and-Test algorithm).
4. Implement informed search techniques (Hill Climbing, Best-First Search).
5. Implement advanced search techniques (A*, AO*).
6. Solve Constraint Satisfaction Problems (N-Queen / Map Coloring).
7. Implement Game Playing algorithms (Minimax and Alpha-Beta pruning).
8. Implement inference techniques (Forward and Backward Chaining).
9. Develop a simple Natural Language Processing application (chatbot/text processing).
10. Implement probabilistic reasoning using Bayesian Network.

TEXT BOOKS:

1. S. Russell & P. Norvig, Artificial Intelligence: A Modern Approach, Pearson Education.
2. E. Rich & K. Knight, Artificial Intelligence, McGraw-Hill.

REFERENCE BOOKS:

1. N. J. Nilsson, Principles of Artificial Intelligence, Tioga Publishing.
2. D. W. Patterson, Introduction to Artificial Intelligence and Expert Systems, Prentice Hall.
3. G. F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education.

ONLINE RESOURCES:

1. https://www.geeksforgeeks.org/artificial-intelligence
2. https://www.tutorialspoint.com/artificial_intelligence
3. https://www.javatpoint.com/artificial-intelligence

COURSE OUTCOMES:

CO1	**Remember** the fundamental concepts of Artificial Intelligence and intelligent agents.
CO2	**Apply** problem-solving techniques using state space search methods.
CO3	**Analyze** heuristic and advanced search algorithms for complex problems.
CO4	**Understand** knowledge representation techniques and logical reasoning.
CO5	**Explain** Natural Language Processing and game playing strategies.
CO6	**Evaluate** reasoning and inference techniques under uncertainty.

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B.E. Semester III

Python Programming (BCOVS404)

Teaching Scheme (Hrs./week)				Credit	Examination Scheme				
L	T	P	Total		SEE	CCE	I/TW	V	Total
0	0	2	2	1	00	00	25	25	50

PREREQUSITE:

A basic knowledge of computer fundamentals and familiarity with operating a computer system. Additionally, logical thinking and problem-solving skills are desirable; however, prior programming experience is not mandatory.

COURSE CONTENT:

Sr. No.	Topics	Hrs (30)
1	**Core Python Programming Concepts:** Advanced data structures (lists, tuples, sets, dictionaries), functions and lambda expressions, file handling (read/write operations), and exception handling techniques.	10
2	**Object-Oriented and Library-Based Programming:** Object-Oriented Programming (classes, objects, inheritance), working with Python libraries (NumPy, Pandas basics), and introduction to data visualization using Matplotlib.	8
3	**Data Acquisition and Application Development:** Web data extraction (web scraping basics), API integration, and development of a mini project integrating learned concepts.	12

LIST OF PRACTICALS:

1. Practical on Data Acquisition and Dataset Handling.
2. Practical on Data Preprocessing Techniques.
3. Practical on Outlier Detection and Treatment.
4. Practical on Feature Engineering and Data Transformation.
5. Practical on Descriptive Statistical Analysis.
6. Practical on Probability and Distribution Analysis.
7. Practical on Hypothesis Testing and Statistical Inference.
8. Practical on Exploratory Data Analysis (EDA).
9. Practical on Data Manipulation using Python Libraries.
10. Mini Project.

TEXT BOOKS:

1. R. Nageswara Rao, Core Python Programming, Dreamtech Press.
2. Wes McKinney, Python for Data Analysis: Data Wrangling with Pandas, NumPy, and

Jupyter, O'Reilly Media.
3. Mark Lutz, Learning Python, O'Reilly Media.

ONLINE RESOURCES:

1. https://docs.python.org/3/
2. https://www.geeksforgeeks.org/python-programming-language/
3. https://realpython.com/
4. https://www.w3schools.com/python/
5. https://numpy.org/doc/

COURSE OUTCOMES:

CO1	**Understand** advanced data structures, functions, and programming constructs in Python.
CO2	**Apply** file handling and exception handling techniques in Python programs.
CO3	**Analyze** object-oriented programming concepts and their implementation in Python.
CO4	**Demonstrate** Python libraries for data manipulation and visualization.
CO5	**Evaluate** data extraction methods including web scraping and API integration.
CO6	**Develop** real-world Python applications through a mini project.

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B.E. Semester IV

Soft Computing (BITPE401)

Teaching Scheme (Hrs./week)			Credit	Examination Scheme				
L	T	P		SEE	CCE	I/TW	V	Total
2	0	2	3	50	50	25	25	150

PREREQUISITE:

Basic understanding of mathematics, especially probability and statistics, is important. Knowledge of programming (preferably Python, SCILAB, or C++) is helpful. Familiarity with algorithms and data structures supports better understanding. Basic concepts of artificial intelligence and machine learning are an added advantage.

COURSE CONTENT:

Sr. No.	Topics	COs	Hrs. (30)
	SECTION-A		
1	**Introduction To Soft Computing:** Evolution of Computing, Concept and Need of Soft Computing, Soft Computing Constituents: Fuzzy Logic, Neural Networks, Evolutionary Computing, From Conventional Artificial Intelligence to Computational Intelligence, Basics of Machine Learning.	1	05
2	**Fuzzy Logic :** Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions: Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making.	2	04
3	**Genetic Algorithms :** Goals of optimization, comparison with traditional methods, schemata, Terminology in GA – strings, structure, parameter string, data structures, operators, coding fitness function, algorithm, applications of GA in Machine Learning.	3	06
	SECTION-B		
4	**Neural Networks:** Machine Learning Using Neural Network, Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks, Radial Basis Function Networks.	4	06
5	**Scilab/Python Lib:** Introduction to Scilab/Python, Arrays and array operations, Functions and Files, Study of neural network toolbox and fuzzy logic toolbox, Simple implementation of Artificial Neural Network and Fuzzy Logic.	5	06
6	**Recent Trends:**	6	03

	Recent Trends in various classifiers, neural networks and genetic Algorithm.		

LIST OF PRACTICALS:

1. Basic Operations using Python/Scilab.
2. Implementation of Membership Functions.
3. Operations on Fuzzy Sets.
4. Design of Fuzzy Inference System.
5. Fuzzy Decision Making System.
6. Implementation of Perceptron Algorithm.
7. Feedforward Neural Network Implementation.
8. Radial Basis Function Network Implementation.
9. Genetic Algorithm for Optimization.
10. Genetic Algorithm for Feature Selection.

TEXT BOOKS:

1. S.N.Sivanandam, S.N.Deepa , Principles of Soft Computing, Wiley India Pvt.
2. Timothy J.Ross, Fuzzy Logic with Engineering Applications, McGraw-Hill

REFERENCE BOOKS:

1. Jyh Shing Roger Jang, Chuen Tsai Sun, Eiji Mizutani, Neuro-Fuzzy and Soft Computing, Prentice Hall of India, 2003.
2. George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, Prentice Hall

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/106105175
2. https://www.coursera.org/specializations/deep-learning
3. https://ocw.mit.edu/courses/6-034-artificial-intelligence

COURSE OUTCOMES:

Sr. No.	CO statement
CO1	**Identify** and describe the fundamental concepts of soft computing, fuzzy sets, and neural network architectures.
CO2	**Evaluate** and compare solutions by applying fuzzy inference systems and evolutionary algorithms to engineering optimization problems.
CO3	**Understand** and implement genetic algorithms and swarm intelligence techniques.
CO4	**Apply** artificial neural network models including deep learning architectures for pattern recognition and prediction tasks.
CO5	**Implement** soft computing techniques using Python/Scilab tools for practical applications.

CO6	**Explore** recent trends and advancements in soft computing techniques and hybrid systems.

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B.E. Semester VI

Internet of Things (BCOPE406)

Teaching Scheme (Hrs./week)				Credit	Examination Scheme				
L	T	P	Total		SEE	CCE	I/TW	V	Total
2	0	2	4	3	50	50	25	25	150

PREREQUISITE:

Understanding core technology, applications, sensors used and IOT architecture along with the industry perspective. Principles and operations of different types of sensors commonly used on mobile platform will be taught in a manner that by the end of the course the students will be able to design and implement real time solutions using IOT.

COURSE CONTENT:

Sr. No.	Topics	COs	Hrs (30)
	SECTION-A		
1	**Introduction to IoT :** IoT Definition & Characteristics, M2M vs IoT, End-to-End IoT Architecture, Physical & Logical Design of IoT, Overview of IoT Protocols, IoT Levels & Deployment Templates, Challenges in IoT, IoT & Cloud Computing Interdependency, Web of Things	**1**	**8**
2	**Sensors, Microcontrollers, and Their Interfacing:** Types of Sensors & Actuators, Sensor Interfacing Techniques, Controlling Sensors, Introduction to Microcontrollers, ARM Architecture Basics, Interfacing Sensors with Microcontrollers	**2**	**7**
3	**Embedded IoT devices:** IoT Components & System Implementation, Programming with NodeMCU & Raspberry Pi, Edge Devices in IoT, Reading Sensor Data & Cloud Transmission, Cloud-based Device Control (Mobile & Web Apps), IoT Gateways: Types, Configurations & Specifications	**3**	**8**
	SECTION-B		
4	**IoT Protocols:** Link Layer Protocols, Network/Internet Layer Protocols, Transport Layer Protocols, Application Layer Protocols: HTTP & Systematic, Access Methodology, WebSocket, CoAP, MQTT, XMPP, DDS,AMQP	**4**	**7**
5	**IoT Security and challenges :** IoT Security Concepts, Threats & Dangers in IoT, Information Value & Risk Assessment, Security Components, Key Management, Update Management, Security Challenges in IoT	**5**	**7**

6	**IoT Applications and case study:** Categories of IoT Applications: Consumer IoT, Commercial IoT, Industrial IoT, Infrastructure IoT, Military IoT (IoMT) Case Studies: Home Automation, River Water Pollution Monitoring, Smart Street Lighting System, Healthcare Monitoring, Voice-enabled IoT Applications	**6**	**8**

LIST OF PRACTICALS:

1. Familiarization with Arduino / Raspberry Pi and perform necessary software installation (Arduino IDE, drivers, libraries).
2. To interface LED/Buzzer with Arduino / Raspberry Pi and write a program to turn ON LED for 1 second after every 2 seconds.
3. To interface Push Button / Digital Sensor (IR/LDR) with Arduino / Raspberry Pi and write a program to turn ON LED when push button is pressed or sensor detects an object.
4. To interface Analog Sensor (LDR/Potentiometer) with Arduino / Raspberry Pi and write a program to read and display analog values on serial monitor.
5. To interface DHT11 sensor with Arduino / Raspberry Pi and write a program to display temperature and humidity readings.
6. To interface OLED/LCD display with Arduino / Raspberry Pi and write a program to display temperature and humidity readings.
7. To connect NodeMCU (ESP8266) with Wi-Fi and write a program to send sensor data to a web server.
8. To upload temperature and humidity data to ThingSpeak cloud using Arduino / NodeMCU.
9. To implement MQTT/HTTP protocol for sending and receiving sensor data between device and cloud/server.
10. Mini Project: Design and implement an IoT-based system (Home Automation / Smart Street Light / Health Monitoring / Pollution Monitoring).

TEXT BOOKS:

1. Vijay Madisetti & Arshdeep Bahga, Internet of Things (A Hands-on Approach), VPT.
2. Francis da Costa, Rethinking the Internet of Things: A Scalable Approach to Connecting Everything, Apress Publications.
3. Cuno Pfister, Getting Started with the Internet of Things, O'Reilly Media.

REFERENCE BOOKS:

1. Olivier Hersent, David Boswarthick & Omar Elloumi, The Internet of Things: Key Applications and Protocols, Wiley.
2. Jan Höller, Vlasios Tsiatsis, Catherine Mulligan, Stamatis Karnouskos, Stefan Avesand & David Boyle, From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, Elsevier.
3. Dieter Uckelmann, Mark Harrison & Florian Michahelles (Eds.), Architecting the Internet of Things, Springer.

ONLINE RESOURCES:

1. Vlabs.iitb.ac.in
2. https://nptel.ac.in
3. www.coursera.org

COURSE OUTCOMES:

CO1	**Understand** core technology, applications, sensors used and IOT architecture along with the industry perspective.
CO2	**Learn** Arduino/ Raspberry's working and implementation.
CO3	**Practice** various communication protocols used in IoT.
CO4	**Examine** various IOT technologies in real-life applications.
CO5	**Analyze** various sensors.
CO6	**Create** global positioning sensors in different systems.

UPL University of Sustainable Technology

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B.E. Semester IV

Universal Human Values (BUNVA431)

Teaching Scheme (Hrs./week)				Credit	Examination Scheme				
L	T	P	Total		SEE	CCE	I/TW	V	Total
2	0	0	2	2	25	25	0	0	50

PREREQUISITE:

Students should have basic awareness of human values, ethics, and social responsibility. Openness to self-reflection, critical thinking, and understanding of personal behavior is important. Familiarity with communication, relationships, and societal issues is helpful. A positive attitude toward learning harmony at individual, family, and societal levels will support better understanding.

COURSE CONTENT:

Sr. No.	Topics	COs	Hrs (30)
	SECTION-A		
1	**Introduction to Value Education :** 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.	1	5
2	**Harmony with self:** Importance of self-awareness: Self-reflection. Who am I? – Imagination & Action. Understanding & exploring needs of self and body. Self -Exploration – A Process of Fundamental Human Desires – Happiness, Peace and Contentment for Material, Behavioral and Intellectual well Being. Holistic understanding of mind & body. The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Program to ensure self-regulation and Health	2	5
3	**Harmony in the Family:** Harmony in the Family – the Basic Unit of Human Interaction, Values in Human-to-Human Relationship, Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation.	3	5
	SECTION-B		
4	**Harmony in the Society:** Understanding Harmony in the Society: Resolution, Prosperity, fearlessness (trust) and co-existence as Comprehensive human goals, Visualizing a universal harmonious order in society.	4	5
5	**Harmony in the Nature/ Existence:** Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at all levels,	5	5

	The Holistic perception of Harmony in Existence.		
6	**Harmony for Global peace:** Understanding global peace. Concept of वसुधैव कुटुम्बकम- one earth one family. Fostering Universal brotherhood and unity, collaborative problem solving, respecting cross cultural communication. Famous anecdote and relevant case studies	**6**	**5**

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. A.N. Tripathi,, Human Values, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book)
4. Mohandas Karamchand Gandhi "The Story of My Experiments with Truth"
5. E. F Schumacher, "Small is Beautiful".
6. Cecile Andrews, "Slow is Beautiful".
7. J C Kumarappa, "Economy of Permanence"
8. PanditSunderlal, "Bharat Mein Angreji Raj"
9. Dharampal , "Rediscovering India"
10. Mohandas K. Gandhi, "Hind Swaraj or Indian Home Rule"
11. Maulana Abdul Kalam Azad , "India Wins Freedom"
12. Romain Rolland, "Vivekananda" (English)
13. Romain Rolland, "Gandhi" (English)

ONLINE RESOURCES:

- https://www.uhv.org.in
- https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw

COURSE OUTCOMES:

CO1	**Understand and analyze** the concept of value education, self-exploration, and the basic human aspirations of continuous happiness and prosperity, along with methods to achieve them.
CO2	**Develop** self-awareness through self-reflection and explore the harmony between self and body for achieving holistic well-being and self-regulation.
CO3	**Inculcate** values such as trust and respect to strengthen harmony in family and interpersonal relationships.
CO4	**Evaluate** the role of individuals in building a harmonious society based on resolution, prosperity, fearlessness, and co-existence.

CO5	**Understand** the interconnectedness in nature and apply the principles of mutual fulfillment and co-existence for sustainable living.
CO6	**Develop** a global perspective by promoting universal brotherhood, cultural harmony, and collaborative problem-solving for achieving global peace.