COURSE CURRICULUM

for

SECOND YEAR B.TECH. DEGREE

in

INFORMATION TECHNOLOGY

(Applicable from the academic session 2024-2025)

Dr. B. C. Roy Engineering College

An Autonomous Institution

Approved by: All India Council for Technical Education (AICTE)

Affiliated to: Maulana Abul Kalam Azad University of Technology, West Bengal (Formerly Known as -WBUT)

Jemua Road, Durgapur, West Bengal, India,713206

Course Name: Mathematics-III

Course Code: IT-301

(Semester III)

Course Broad Category: Basic Science Course

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1. **Course Prerequisite:**
   Concept of Mathematics in B. Tech 1st and 2nd semester.

2. **Course Learning Objectives:**
   This module provides students with essential mathematical tools for analyzing and solving real-world problems. It introduces concepts of probability, including random variables, key distributions, and stochastic processes like Markov chains and Poisson Processes. Students will learn statistical methods such as measures of central tendency, correlation, regression, curve fitting, and hypothesis testing for data analysis. Numerical approximation techniques are covered, focusing on interpolation and solving nonlinear equations while understanding numerical errors and solution of ODE by numerical Methods. The module also explores methods for solving optimization problems involving single variable and multivariable functions.

3. **Teaching methodology and evaluation system for the course:**
   Teaching methodology – Lectures and Presentations, Interactive Discussions and Case Studies, Guest Lectures.

   Evaluation System –

A. Mid-Term Exam (20 Marks)- Summative Assessment (CIA-1)
B. Internal Assessment (20 Marks)- Formative Continuous Assessment [Continuous Assessment 1 (CIA-2)]
C. End-Semester Exam (60 Marks)- Summative Assessment.

4. **Course Content:**
   Course Name: Mathematics-III
   Course Code: IT-301
   Hours per Week: 3L: 0T: 0P
   Credits: 3

Module	Topics	45L
1.	**Probability:** Review on Basic Probability theory, Random Variable, Discrete and continuous random variables, Mathematical expectation, properties of expectation and variance, Discrete (Binomial and Poisson's distribution) and Continuous Probability Distribution (Normal and exponential distribution). Continuous and Discrete Bivariate distributions and their properties, Conditional and Marginal densities.	10L

Module	Topics	45L
2.	**Stochastics Process:** Definition, classification, and examples of stochastic processes; stationary and autoregressive processes; discrete-time Markov chains; continuous-time Markov chains, Poisson process.	8L
3.	**Statistics:** Law of large numbers, central limit theorem, sampling distributions, chi square distribution, Student's 't' distribution, F distribution. **Applied Statistics:** Correlation and regression – Rank correlation, Curve fitting by the method of least squares- fitting of straight lines. **Inferential Statistics:** Estimation of Parameters: Point estimation: sufficiency, unbiased estimation, maximum likelihood estimation, confidence intervals for mean, Hypothesis testing: type-I and type-II errors, One and two tailed tests. Test for single mean, difference of means, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.	12L
4.	**Approximation in numerical computation:** Motivation and application, Rounding off a number, Different types of error (Significant, inherent, Truncation etc.), Different kinds of difference operators. **Interpolation-** Newton forward/ backward interpolation, Lagrange's interpolation formula. **Numerical solutions of nonlinear algebraic/transcendental equations**: Bisection and Newton-Raphson methods. **Solution of ODE:** RK4 Method.	9L
5.	**Optimization:** Hyperplanes and Linear Varieties; Convex and concavity of non-linear function. Introduction and Classical Optimization Techniques: Statement of an Optimization problem, classification of Optimization problems. Classical Optimization Techniques: Single variable Optimization, multi variable Optimization- without constraints, multivariable Optimization with equality constraints- Solution by method of Lagrange multipliers, Multivariable Optimization with inequality constraints – Kuhn – Tucker conditions.	6L

5. References:

Text Book:

- Kapoor, V.K., and Gupta, S.C.: Fundamentals of Mathematical Statistics, Sultan Chand & Sons.
- Kapoor, V.K., and Gupta, S.C.: Fundamentals of Applied Statistics, Sultan Chand & Sons.
- Medhi, J.: Stochastic Processes, New Age International Publishers.
- Ravindran, Phillips, Solberg: Operations Research Principles and Practices
- M. K. Jain, S.R.K. Iyengar & R.K. Jain: Numerical Methods for scientific & Engineering Computation.
- E. Kreyszig: Advanced Engineering Mathematics, Wiley Publications

Reference Books:

- Mukhopadhyay, P.: Mathematical Statistics, New Central Book Agency.
- Dreyfus, S.E.: The Art and Theory of Dynamic Programming: Theory and Applications, Academic Press.
- Goon, A.M., Gupta, M.K., and Dasgupta, B.: Outlines of Statistics, Vol. II, The World Press Private Ltd.

- Hoel, P.G.: Introduction to Mathematical Statistics, John Wiley & Sons.
- Hogg, R.V., Tanis, E.A., and Rao, J.M.: Probability and Statistical Inference (7th Edition), Pearson.
- Kalyanmoy Deb, "Optimization for Engineering Design – Algorithms and Examples", PHI Learning Pvt. Ltd, New Delhi, 2005.
- Stephen G. Nash, A. Sofer: Linear and Non-linear Optimization, McGraw Hill
- S.S. Sastry: Introductory methods of Numerical Analysis, PHI learning.

6. Course Outcomes (CO):

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
IT-301.1	Learn to apply different tools in basic probability theory which would enable them to devise engineering solutions to encounter in their profession life.	Identify	Remember
IT-301.2	Understand the uncertainties and risks, and to model and analyze the lifetime or failure characteristics of components, systems, or processes.	Explain	Understand
IT-301.3	Apply statistical tool in analyzing the data in making decisions of any real-life problems.	Implement	Apply
IT-301.4	Solve complex problems using numerical methods and approximation techniques with precision and accuracy.	Organize	Analyze
IT-301.5	Formulate and optimize solutions for practical problems by applying systematic and logical approaches.	Assess	Evaluate
IT-301.6	Build up logical and analytical skills to create a new idea appreciated by academics, research & emerging trends in industry.	Construct	Create

7. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	2	1	-	-	1
2	2	3	1	-	-	1
3	2	1	3	1	-	1
4	1	-	2	3	-	1
5	2	1	2	2	3	1

8. Mapping of the Course outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	2	2	1	1	2	-	-	-	-	-	-	1
CO2	1	2	3	1	-	-	-	-	-	-	-	1
CO3	1	2	2	1	1	-	-	-	-	-	-	1
CO4	1	2	1	1	2	-	-	-	-	-	-	2
CO5	2	2	2	2	3	-	-	-	-	-	-	1
CO6	1	1	1	1	-	-	-	-	-	-	-	1

9. Mapping to Program Specific Outcome (PSO)

	PSO1	PSO2	PSO3	PSO4
CO1				
CO2				
CO3				
CO4				
CO5				
CO6				

Course Name: Data Structure and Algorithm
Course Code: IT-302
(Semester– III)
Course Broad Category: Professional Core Course

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1. Course Prerequisite:

- Programming for Problem Solving (CS-202)

2. Course Learning Objectives:

- **Understand Fundamental Concepts**
  - Comprehend the basic concepts of data structures, algorithms, complexity analysis, and asymptotic notation.
  - Analyze time and space complexity for different algorithms.
- **Implement and Manipulate Data Structures**
  - Develop proficiency in implementing fundamental data structures such as arrays, stacks, queues, linked lists, trees, and graphs.
  - Apply appropriate data structures for problem-solving and optimize memory usage.
- **Master Searching, Sorting, and Hashing Techniques**
  - Analyze and compare different searching and sorting algorithms in terms of efficiency and performance.
  - Understand hashing techniques and their applications in data retrieval.
- **Apply Advanced Data Structure Concepts**
  - Implement tree and graph algorithms, including traversal, shortest path calculations, and minimum spanning trees.
  - Develop problem-solving skills by applying learned concepts in real-world applications.

3. Teaching methodology and evaluation system for the course:

Teaching methodology –Lectures and Presentations, Interactive Discussions and Case Studies.

Evaluation System –

A. Mid-Term Exam (20 Marks)- Summative Assessment (CIA-1)
B. Internal Assessment (20 Marks)- Formative Continuous Assessment [Continuous Assessment 1 (CIA-2)]
C. End-Semester Exam (60 Marks)- Summative Assessment.

4. Course Content:

Course Name: Data Structure and Algorithm
Course Code: IT-302
Hours per Week: 3L: 0T: 0P
Credits: 3

Module	Topics	Lectures
1	**Introduction:** Data and Information, Algorithm: Definition, Properties, Complexity Analysis : Time Complexity, Space Complexity, Asymptotic Notation: Big Oh(O), Omega (Ω), Theta (θ).Time Complexity Analysis : O(1), O(log n), O(n), O(n log n), $O(n^2)$, $O(n^3)$, $O(2^n)$, Properties of Big Oh (O), Different Data Type, User defined Data Type, Structure and its use, Function and Recursion and Tail Recursion, Tower of Hanoi problem, Array Data Structure and Operations: insertion, deletion, traversal etc.; 2D Array representation: Row Major ordering, Column Major ordering, Sparse Matrix representation, Triangular Matrix, Polynomial Representation	7
2	**Stacks and Queues:** ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis, Applications of Queue.	8
3	**Linked Lists:** Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.	8
4	**Searching and Sorting and Hashing:** Searching: Linear Search and Binary Search Technique sand their complexity analysis.Sorting :Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing.	7
5	**Trees:** Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis.	9
6	**Graph:** Basic Terminologies and Representations, Graph search and traversal algorithms: BFS, DFS; Shortest Path Calculation: Dijkstra's Algorithm; Spanning Tree, Minimum Spanning Tree : Kruskal's Algorithm, Prim's Algorithm and complexity analysis.	6

5. References:

Text & References Books:

- "Data Structures And Program Design In C", 2/E by Robert L. Kruse, Bruce P. Leung
- "Fundamentals of Data Structures of C" by Ellis Horowitz, Sartaj Sahni, Susan Anderson-freed
- "Data Structures in C" by Aaron M. Tenenbaum
- "Data Structures" by S. Lipschutz
- "Data Structures Using C" by Reema Thareja

- "Data Structures and Algorithm" by Arup Kr. Bhaumik, Santanu Haldar, Subhrajit Sinha Roy

6. Course Outcomes (CO):

After completing this course, students will be able to :

Course Outcomes	Details	Action Verb	Knowledge Level
IT-302.CO1	Understand fundamental algorithm concepts, complexity analysis, and asymptotic notations.	Understand, Analyze	L-2
IT-302.CO2	Implement Stack and Queue data structures, perform operations, and apply them to real-world problems.	Implement, Apply	L-3
IT-302.CO3	Develop and manipulate Linked Lists (Singly, Doubly, Circular) for efficient data handling.	Develop, Manipulate	L-4
IT-302.CO4	Compare and evaluate searching and sorting techniques based on performance and efficiency.	Compare, Evaluate	L-4
IT-302.CO5	Design and implement Tree data structures (Binary, AVL, B-Trees) and analyze their operations.	Design, Implement	L-5
IT-302.CO6	Apply Graph algorithms (BFS, DFS, Dijkstra's, Kruskal's, Prim's) for problem-solving.	Apply, Optimize	L-6

7. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	-	-	-
2	-	3	-	-	-	-
3	-	-	3	-	-	-
4	-	-	-	3	-	-
5	-	-	-	-	3	-
6	-	-	-	-	-	3

8. Mapping of the Course outcomes to Program Outcomes (PO)

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

9. Mapping to Program Specific Outcome (PSO)

	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	-
CO2	3	3	3	-
CO3	3	3	3	-
CO4	3	3	3	-
CO5	3	3	3	1
CO6	3	3	3	1

***** End of Syllabus*****

Course Name: Analog & Digital Electronics
Course Code: IT- 303
(Semester III)
Course Broad Category: Engineering Science Course

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1. **Course Prerequisite:**
   a) Basic Electronics Parts I & II learned in the First year, semesters 1 & 2. Basic BJTs,.
   b) Basic concept of the working of P-N diodes, Schottky diodes,
   c) Basic FETs and OPAMP as a basic circuit component. Concept of Feedback

2. **Course Learning Objectives:**
   I. To acquire the basic knowledge of different analog components and their applications
   II. To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
   III. To prepare students to perform the analysis and design of various digital electronic
   IV. circuits

3. **Teaching methodology and evaluation system for the course:**
   Teaching methodology – Lectures and Presentations, Interactive Discussions and Case Studies.
   Evaluation System –
   A. Mid-Term Exam (20 Marks)- Summative Assessment (CIA1)
   B. Internal Assessment (20 Mark)- Formative Continuous Assessment [Continuous Assessment (CIA2)]
   C. End-Semester Exam (60 Marks)- Summative Assessment.

4. **Course Content:**
   Course Name: Analog & Digital Electronics
   Course Code: IT-303
   Hours per Week: 3L:0T:0P
   Credits: 3

Module	Topics	36L
1.	Various Classes of Amplifiers - (Class-A, B, AB and C - basic concepts, power, efficiency. Feedback topologies: Voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc., calculation with practical circuits, concept of stability, gain margin and phase margin. Oscillators: Review of the basic concept, Barkhausen criterion, RC oscillators (phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitt, Clapp etc.), non-sinusoidal oscillators. OP-AMP applications: review of inverting and non-inverting amplifiers, integrator and differentiator, summing amplifier, precision rectifier, Schmitt trigger Astable & Monostable Multivibrators, and its applications.; Basic concept & application of 555 Timer	11L
Module	**Topics**	**36L**

2.	Binary Number System & Boolean Algebra (recapitulation); BCD, ASCII, EBDIC, Gray codes and their conversions; Signed binary number representation with 1's and 2's complement methods, Binary arithmetic, Venn diagram, Boolean algebra (recapitulation); Representation in SOP and POS forms; Minimization of logic expressions by K-map **Combinational circuits** - Adder and Subtractor circuits (half & full adder & subtractor); Encoder, Decoder, Comparator, Multiplexer, De- Multiplexer and Parity Generator	9L
3.	**Sequential Circuits** - Basic Flip-flop & Latch, **Flip-flops** - SR, JK, D, T and JK Master-slave Flip Flops, **Registers** (SISO, SIPO, PIPO, PISO) **Counters** Ring counter, Johnson counter Basic concept of Synchronous and Asynchronous counters (detail design of circuits excluded), Design of Mod N Counter.	10L
4.	A/D and D/A conversion techniques – Basic concepts D/A :R-2-R only [2L] A/D: successive approximation [2L]) Logic families- TTL, ECL, MOS and CMOS - basic concepts. (2L)	6L

6. References:

Text Book:

- Digital Electronics – Kharate – Oxford
- Morries Mano- Digital Logic Design- PHI
- R.P.Jain—Modern Digital Electronics, 2/e ,McGraw Hill
- A.V.N. Tilak, Design of Analog Circuits, Khanna Publishing House, 2022.
- J.V. Wait, L.P. Huelsman and GA Korn, Introduction to Oper

Reference Books:

- Floyed & Jain- Digital Fundamentals-Pearson
- Tocci, Widmer, Moss- Digital Systems,9/e- Pearson
- H.Taub & D.Shilling, Digital Integrated Electronics- McGraw Hill.
- A.S. Sedra and K.C. Smith, Microelectronic Circuits, Saunder's College Publishing, Edition IV
- Paul R.Gray & Robert G.Meyer, Analysis and Design of Analog Integrated Circuits, John Wiley, 3rd Edition

7. Course Outcomes:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
IT-303.1	Realize the different circuit configuration of different devices for various applications.	Explain	Understand
IT-303.2	Design various analog circuits required in electronic systems.	Identify, Select	Understand, Apply
IT-303.3	To learn Postulates of Boolean algebra and to minimize combinational functions.	Identify	Understand
IT-303.4	Design and analyze of MUX/DEMUX, Decoder, Encoder and other combinational logic circuits	Implement	Apply
IT-303.5	Design & analyze of Sequential Circuits.	Design	Create
IT-303.6	Understand basic structure of digital computer, stored program concept and different arithmetic and control unit Operations.	Identify, Implement ,Recognize	Apply

8. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	2	3	-	-	-	-
2	-	-	2	3	-	-
3	2	-	-	-	3	-
4	2	-	-	-	-	3

9. Mapping of the Course outcomes to Program Outcomes

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

Course Name: Problem Solving using Python

Course Code: IT-304

(Semester–III)

Course Broad Category: Professional Core Course

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1. Course Prerequisite:

- Basic knowledge of computers and programming language.

2. Course Learning Objectives:

I. **Fundamentals of Python Programming & Algorithmic Thinking** – Understand the basics of programming, python language syntax, compilation process, and develop algorithmic problem-solving skills using flowcharts and pseudo code.
II. **Control Structures, Functions & Data Handling** – Implement decision-making constructs (if-else, switch), loops (for, while), functions (including recursion), pointers, arrays (1D, 2D), and string manipulation.
III. **Advanced Concepts & Preprocessing** – OOP's and different python packages like numpy,matplotlib, pandas etc.
IV. **Application in Problem-Solving** – Apply programming concepts to solve real-world problems .

3. Teaching methodology and evaluation system for the course:

Teaching methodology –Lectures and Presentations, Interactive Discussions and Case Studies.

Evaluation System –

A. Mid-Term Exam (20 Marks)- Summative Assessment (CIA-1)
B. Internal Assessment (20 Marks)- Formative Continuous Assessment [Continuous Assessment 1 (CIA-2)]
C. End-Semester Exam (60 Marks)- Summative Assessment.

4. Course Content:

Course Name: Problem Solving using Python

Course Code: IT-304
Hours per Week:
3L:0T:0P
Credits: 3

Module	Topics	Lectures
1	**Introduction to Python Programming:** BasicsofAlgorithm/Pseudocode,Program,KindsofProgrammingLanguages,Compilers,and Interpreters Introduction to Python, Types of IDE (Anaconda/ PyCharm) Identifiers, Variables, Operators, DataTypes, Conditions,	6
2	**Introduction to Data Structures using Python: Strings**: Introduction, functions, and operations on Strings, Application Programs on Strings. **List:**Introduction,functionsandoperationsonList,ApplicationProgramson Lists **Tuple:** Introduction ,functions, and operations onTuple **Dictionaries**: Introduction, functions and operations on Dictionaries, Application Programs on Dictionaries. **Sets:**Introduction,functions,and operations on Sets,Applications onSets, Frozensets,List Comprehension, Dictionary Comprehension	6
3	**Functions, Modules and Collections** : Functions Defining and Invoking functions, Scope, Parameter types Recursive functions, Built in Functions such as enumeration, zip, sorted, map, filter and Applications Modules in Python, creating custom modules and calling them Lambdafunctions,Collections,Iterators,Generators,Decorators,OrderedDict,defaultdictetc	8
4	**Working with Databases and Text:** File I/O operations: Reading and Writing data from various formats, Regular Expressions, Identifiers, Quantifiers. Application Programs on Regular Expressions **Working with Databases:** Databases and Data Science, SQLite database and Insert, Update, Delete, Retrieve operations, Exception Handling: Need for Exception handling, Raising exceptions,	7
5	**Object Oriented Programming using Python :** Need for Static, Static members, Static functions Need for Encapsulation and Abstraction, Private Attributes, Getter, and Setter Methods– Python Implementation **Inheritance:** Need for Inheritance, Kinds of Inheritance Polymorphism, Abstract methods,OverloadingandOverriding Statistics for Data Science **UseCase:** Mathematical Computing with NumPy	10
6	**Exploratory DataAnalysis:** Statistics and Probability using Numpy Data Manipulation and Exploratory Data Analysis with Pandas Matplotlib and Seaborn	07

	libraries for Visualization WebProgrammingusingFlask,GUIprogrammingTCLTK	

5. Books:

1. AlSweigart,"AutomatetheBoringStuffwithPython",WilliamPollock,2015, ISBN: 978-1593275990.

Reference Books:

1. AllenB. Downey, "ThinkPython:How toThink Like aComputer Scientist",2nd Edition, Green Tea Press, 2015, ISBN: 978-9352134755.
2. Charles Dierbach, "Introduction to Computer Science Using Python", 1st Edition, Wiley India Pvt Ltd. ISBN-13: 978-8126556014.
3. WesleyJChun,"CorePythonApplicationsProgramming",3rdEdition,PearsonEducation India, 2015. ISBN-13: 978-9332555365.
4. RobertoTamassia,MichaelHGoldwasser,MichaelTGoodrich,"DataStructuresand AlgorithmsinPython",1stEdition,WileyIndiaPvtLtd,2016.ISBN-13:978-8126562176.
5. ReemaThareja,"PythonProgrammingusingproblemsolvingapproach",OxfordUniversity press, 2017. ISBN-13: 978-0199480173
6. CharlesR.Severance,"PythonforEverybody:ExploringDataUsingPython3", 1st Edition, Shroff Publishers, 2017. ISBN: 978-9352136278.

WebReference:

https://infytq.infosys.com/

6. Course Outcomes (CO):

After going through this course, the Students will be able to:

CourseOutcomes	Details	ActionVerb	Knowledge Level
IT-304.CO1	**Explain** the basics of python programming, including program structure, compilation process, syntax errors, and the concept of algorithms with flowcharts and pseudocode.	Understand	L-2
IT-304.CO2	**Demonstrate** :Demonstrate the concepts of control structures in Python	Apply	L-3
IT-304.CO3	**Develop**: Implement methods to create and manipulate, lists, tuples and dictionaries	Apply	L-3
IT-304.CO4	**Illustrate** : Apply the concepts off file handling and packages	Analyze	L-4
IT-304.CO5	**Design** and **implement** : the working of scraping websites with CSV.	Create	L-6
IT-304.CO6	**Design** and **implement:** implement a real life project using python	Create	L-6

7. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	-	-	-
2	-	3	-	-	-	-
3	-	-	3	-	-	-
4	-	-	-	3	-	-
5	-	-	-	-	3	-
6	-	-	-	-	-	3
7	-	-	-	-	-	3

8. Mapping of the Course outcomes to Program Outcomes (PO)

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

9. Mapping to Program Specific Outcome (PSO)

	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	-
CO2	3	3	2	-
CO3	3	3	3	-
CO4	3	3	3	-
CO5	3	3	3	2
CO6	3	3	3	2

***** End of Syllabus*****

Course Name: BIOLOGY FOR ENGINEERS

Course Code: IT-305

(Semester- III)

Course Broad Category: BASIC SCIENCE COURSE

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1. **Course Prerequisite:**
   - ❖ Class-X-XII level knowledge of Biology and Bio-Environmental Science.
   - ❖ Undergraduate level introductory knowledge of Bio- Engineering.

2. **Course Learning Objectives:**
   - ❖ This course imparts basic knowledge of biology, evolution, general awareness of environmental pollution effects and bio-engineering's aspects with cancer biology that provides the basic ideas among the engineering students for a better foundation of technical education.
   - ❖ To provide fundamentals among the upcoming young engineers and to carry out advanced technical and machinery research projects in biology and allied domains.

3. **Teaching methodology for the course:**

Teaching methodology –

- ❖ Lectures and Presentations,
- ❖ Interactive Discussions and Studies,
- ❖ Guest Lectures ,
- ❖ Field Visits.

4. **Evaluation System for the course：**

   Evaluation System –

   A. Mid-Term Exam (20 Marks)- Summative Assessment (CIA-1)

   B. Internal Assessment (20 Marks)- Formative Continuous Assessment [Continuous Assessment 1 (CIA-2)]

   C. End-Semester Exam (60 Marks)- Summative Assessment.

5. **Course Content:**

   Course Name: Biology For Engineers

   Course Code: BSC-302

   Hours per Week: 3L: 0T: 0P

   Credits: 3

Module	Topics	36 L
1.	**Introduction to Biology in Engineering** • Science & Engineering • Biology in Engineering • Instruments inspired by Biology (Camera and Aeroplane) • Major Biological discoveries of18thto21thCentury. CO Explain that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry.	3L
2.	**Cell Biology** • Cell types (Unicellular & Multi cellular, Prokaryotic & Eukaryotic, Plant & Animal Cell) • Cell organelles and the irfunction (Cell Wall, Cell Membrane, Nucleus, Ribosome, Mitochondria and other cellular organelles) • **Cell Division** • Biomolecules - Carbohydrates, Proteins, Lipids and Nucleic Acids, • Biochemical qualitative tests for macromolecules CO Identify that Cell is a basic material of life, required biomolecules are valuable for Cell, i.e. living organisms.	5L
3.	**Microbiology** • Classification of microorganisms, Bacteria, viruses, fungi, and protozoa. • Hierarchy classification of living organisms. • Growth curves and factors affecting growth. • Applications in Engineering (Industrial microbiology and Environmental Microbiology, Soil Engineering) CO Demonstrate that hierarchy classification of living organisms and their growth factors and also economic engineering application.	3L
4.	**Genetical Engineering** • Laws of inheritance, Monohybrid and dihybrid crosses, Extensions to Mendelism • Molecular basis of Inheritance (DNA replication, transcription, and translation, Genetic code and mutations) • Concept of Gene, Gene mapping, Concept of operon, Geneticdisorders CO Develop that Genetics is the main part of bio-engineering.	4L
5.	**Biochemistry and Biophysical techniques** • Thermodynamics in Biology, Enzyme Kinetics and Regulation • Metabolic Pathways (Glycolysis, Krebscycle, oxidative phosphorylation: Cell surface receptors, signaling through G-protein coupled receptors, Phosphatidyl inositol pathway, second messengers, cellular transport-Na+-K+ ATPase pump.) • Hormones • Biophysical techniques (Chromatography, Electrophoresis,	5L

Module	Topics	36 L
	Spectroscopy, Centrifugation, Microscopy, PCR) CO Explain that biochemistry and biophysics gives us details knowledge about all bio-metabolisms of living organisms.	
6.	**Environmental Bio-Engineering** • Origin of Life and theories of Evolution, Natural selection and adaptation, Phylogenetic Tree, • Patterns and Mechanism of Evolution (Genetic Grift, Mutation, Genetic Variation, Gene Flow,) • Evolution in Human Genome CO Remember that Evolution, is a very important part of human genetic mutation, which can keeping pace with evolution. • Ecosystems, Biodiversity and its importance, Pollution and its effects • Bioremediation(Principlesandtechniques,Applicationsinenvironmental engineering) • Engineering technology in Wildlife Sciences and Conservation CODesign that there is a relationship between environment and bio engineering.	6L
7.	**Biotechnology & Bioinformatics** • Principles and processes of Biotechnology • Application of Biotechnology in health and agriculture • Recombinant DNA Technology, Tissue Culture • Bioinformatics tools and databases, Sequence alignment and analysis, Applications CODemonstrate applications of Bioinformatics and biotechnology in your daily life.	5L
8.	**Immunology & Cancer Biology** • Innateandadaptiveimmunity,Cellsandorgansoftheimmunesystem,Humoral and cell-mediated immunity • Immunological Disorders and treatment • Types and stages of cancer, Genetic and environmental factors • Molecular Mechanisms (Oncogenes and tumor suppress orgenes, Cell cycle regulation and apoptosis) and Treatment. CO Presenting the details information of bio engineering applications in medical field according to diseases and its treatments.	5L

9. References Text Book:

1. Biology of Engineers, McGraw Hill (ISBN: 978-11-21439-931)
2. Biology For Engineers: Dr. Sandhimita Mondal & Dr. Arnab Ganguli :Aryan Publishing House

3. Lehninger's Principles of Biochemistry by David L Nelson; A.L. Lehninger and Michael M. Cox, 5th edition, Worth Publishing.
4. Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company.
5. Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H., John Wiley and Sons.
6. Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C. Brown Publishers
7. Principles Of Cancer Biology : Lewis J. Kleinsmith : Pearson Education Limited Edinburgh Gate, Harlow,
Essex CM20 2JE ISBN 10:1-292-02788-6 ISBN 13: 978-1-292-02788-3 Pearson Education India.
8. Fundamentals of Biochemistry : J.L Jain : S CHAND & Company Limited

10. Reference Books:

1. Molecular Genetics (Second edition), Stent, G. S.; and Calender, R.W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher.
2. Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd
3. Smith &Vanness, Thermodynamics for Chemical Engineers, MGH
4. Shuler and Kargi, Bioprocess engineering: Basic concepts, 2nd edition, Prentice Hall publisher
5. Electron Microscopy in Biology: J. R. Harris (ed).
6. Biochemistry by Lubert Stryer, John L Tymoczko, Jerry M. Berg, 5th edition, W.H. Freeman Company.
7. Principles of Fluorescence Spectroscopy, J.R. Lakowicz; (Springer)
8. Fundamentals of Molecular Spectroscopy - C.N. Banwell, (Tata- McGraw-Hill)
9. Biological Spectroscopy-I.D. Cambell & R.A. Durk, (Benjamin Cummings)
10. Biophysics-V. Pattabhi & N. Gautham (Narosa, New Delhi)
11. Introduction to Electron Microscopy: S. Wischnitzer.
12. Textbook of soil and water conservation, AUTHORS: RAJIV DUBEY, VINAY KUMAR GAUTAM, DEEPAK SHARMA, LAXMI L. SOMANI AND R.C. DADHEECH PUBLISHING YEAR: 2020 ISBN: 9788183215350

13. Course Outcomes:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
IT-305.1	Explain that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry.	Explain	Understand
IT-305.2	Identify that the cell is a basic material of life, required biomolecules are valuable for Cell, i.e. living	Identify,	Understand
IT-305.3	Demonstrate the hierarchy classification of living organisms and their growth factors and also economic engineering application	Demonstrate	Apply
IT-305.4	Develop that Genetics is the main part of	Develop	Create

	bio-engineering.		
IT-305.5	Explain that biochemistry and biophysics gives us details knowledges about all bio-metabolisms of living organisms.	Explain	Understand
IT-305.6	Rememberthat Evolution, is a very important part of human genetic mutation, which can keeping pace with evolution. Design that there is a relationship between environment and bio engineering.	Remember Design	Understand Create
IT-305.7	Demonstrate applications of Bioinformatics and biotechnology in your daily life.	Demonstrate	Apply
IT-305.8	Presenting the details information of bio engineering applications in medical field according to diseases and its treatments.	Presenting	Analyse

14. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6	CO7	CO8
1	3	-	-	-	-	-	-	-
2	-	3	-	-	-	-	-	-
3	-	-	3	2	-	-	3	-
4	-	-	2	3	-	-	-	3
5	-	-	-	-	3	-	-	-
6	-	-	-	-	-	3	-	-
7	3	-	-	-	2	-	2	-
8	-	3	2	-	-	-	-	-

15. Mapping of the Course outcomes to Program Outcomes

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

CO7												
CO8												

16. Mapping to PSO

	PSO1	PSO2	PSO3	PSO4
CO1				
CO2				
CO3				
CO4				
CO5				
CO6				
CO7				
CO8				

Course Name: Data Structure and Algorithm Lab Course
Code: IT-392
(Semester –III)
Course Broad Category: Professional Core Course

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1. Course Prerequisite:

- Programming for Problem Solving Lab (CS-292)

2. Course Learning Objectives:

- To develop proficiency in implementing fundamental data structures such as arrays, stacks, queues, linked lists, and trees, along with their various operations.
- To enhance problem-solving skills by applying data structures in practical scenarios, including searching, sorting, expression conversion, and polynomial operations.
- To gain hands-on experience in implementing advanced data structures such as binary search trees and hash tables, along with associated algorithms.
- To understand and implement efficient algorithms for shortest path calculation and recursion, fostering algorithmic thinking and optimization.

3. Teaching methodology and evaluation system for the course:

Teaching methodology –Lectures and Presentations, Interactive Discussions and Case Studies.

Evaluation System –
A. Internal Assessment (60 Marks)- Formative Continuous Assessment
B. End-Semester Exam (40 Marks)- Summative Assessment.

4. Course Content:

Course Name: Data Structure and Algorithm Lab
Course Code: IT-392
Hours per Week: 0L: 0T: 4P
Credits: 2

Unit	Content
1	Implementation Function, Recursive Function, Tail Recursion, Structure related problem
2	Implement 1D Array Data Structure and its Operations: insertion, deletion, traversal etc.; 2D Array representation: Row Major ordering, Column Major ordering, Sparse Matrix representation, Triangular Matrix
3	Implement Stack and its operations: Push, Pop, Traversal, Applications of Stacks: Expression Conversion
4	Implement Queue and its operations: Insert, Delete, Traversal; Circular Queue and its operations: Insert, Delete, Traversal
5	Implement Single Link List and its operations: Insert, Delete, Traversal; Circular Link List; Double Link List and its operations: Insert, Delete, Traversal
6	Implement Stack and Queue and its operations using Link List

7	Implement Polynomial Addition and Multiplication
8	Implement Searching : Linear and Binary, Sorting: Bubble, Insertion
9	Implement Sorting: Selection Sort, Quick, Merge
10	Implement Binary Search Tree and its operations: Insertion, Deletion, Pre-order Traversal, Post-order Traversal, In-order Traversal.
11	Implement Shortest Path Calculation: Dijkstra's Algorithm
12	Implement Hash Table: Inserting, Searching and Deleting

5. References:

Text & References Books:

- "Data Structures And Program Design In C", 2/E by Robert L. Kruse, Bruce P. Leung
- "Fundamentals of Data Structures of C" by Ellis Horowitz, Sartaj Sahni, Susan Anderson-freed
- "Data Structures in C" by Aaron M. Tenenbaum
- "Data Structures" by S. Lipschutz
- "Data Structures Using C" by Reema Thareja
- "Data Structures and Algorithm" by Arup Kr. Bhaumik, Santanu Haldar, Subhrajit Sinha Roy

6. Course Outcomes (CO):

After going through this course the Students will be able to:

Course Outcomes	Details	Action Verb	Knowledge Level
IT-392.CO1	Implement fundamental data structures such as arrays, stacks, queues, and linked lists along with their operations.	Implement	L-3
IT-392.CO2	Apply searching and sorting techniques (Linear Search, Binary Search, Bubble Sort, Quick Sort, Merge Sort, etc.) to organize and retrieve data efficiently.	Apply	L-3
IT-392.CO3	Develop and manipulate stack-based and queue-based algorithms, including expression conversion and circular queue operations.	Develop, Manipulate	L-4
IT-392.CO4	Construct and traverse Binary Search Trees, understanding their operations like insertion, deletion, and different traversal methods.	Construct, Traverse	L-4
	Implement polynomial operations and hash table techniques for optimized storage and retrieval of data.	Implement	L-3
IT-392.CO6	Analyze and apply graph algorithms like Dijkstra's algorithm to solve shortest path problems efficiently.	Analyze, Apply	L-5

7. Mapping of course outcomes to module / course content

Unit	CO1	CO2	CO3	CO4	CO5	CO6
1, 2, 5	3	-	-	-	-	-
8, 9	-	3	-	-	-	-
3, 4, 6	-	-	3	-	-	-
10	-	-	-	3	-	-
7, 12	-	-	-	-	3	-
11	-	-	-	-	-	3

8. Mapping of the Course outcomes to Program Outcomes (PO)

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

9. Mapping to Program Specific Outcomes (PSO)

	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	1
CO2	3	3	3	1
CO3	3	3	3	2
CO4	3	3	3	2
CO5	3	2	2	1
CO6	3	2	3	1

***** End of Syllabus*****

Course Name: Analog & Digital Electronics Lab

Course Code: IT- 393

(Semester III)

Course Broad Category: Engineering Science Courses)

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1. Pre requisite:

The concept of digital circuits and Boolean algebra. Pin configuration of digital IC is required to know before the experiment.

2. Course Objectives:

- To establish the Boolean algebra and logic gates.
- To know how digital IC works using different logic families.
- To be aware about the preliminary stages of digital systems that will help to understand some of the future courses like DSP and Digital Communication.

3. Teaching methodology and evaluation system for the course:

Teaching methodology: Instruction: This method recognizes that students have different learning styles, abilities, and backgrounds, and aims to create a learning environment that accommodates these differences.

Evaluation System –

A. **Internal Assessment (60 Marks)-** Formative Continuous Assessment [Continuous Assessment; Note Book (30 Marks), Viva Voce (20 Marks), Attendance (10 Marks)]
B. **End-Semester Exam (40 Marks)-** Summative Assessment.

4. Course Content:

Course Name: Analog & Digital Electronics Lab
Course Code: IT 393
Hours per Week: 0L: 0T: 2P
Credits: 1

5. Laboratory Experiments:

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Laboratory Experiments:		**15L**
Analog Electronics		**3L**
1	Design a Class A amplifier	1L
2	Design a Phase-Shift Oscillator	1L
3	Design of a Schmitt Trigger using 555 timer	1L

Digital Electronics		12L
4	Design a Full Adder / a Full Subtractor circuit	2L
5	Construction of simple Decoder & Multiplexer circuits using logic gates.	2L
6	Realization of RS / JK / D flip flops using logic gates	1L
7	Design of Shift Register using J-K / D Flip Flop	2L
8	Realization of Synchronous Up/Down counter	2L
9	Design of MOD- N Counter	1L
10	Study of DAC	1L
11	Any experiment specially designed by the college	1L

6. References:

Text Book:

- Digital Electronics – Kharate – Oxford
- Morries Mano- Digital Logic Design- PHI
- R.P.Jain—Modern Digital Electronics, 2/e ,McGraw Hill
- A.V.N. Tilak, Design of Analog Circuits, Khanna Publishing House, 2022.

Reference Books:

- Floyed & Jain- Digital Fundamentals-Pearson
- Tocci, Widmer, Moss- Digital Systems,9/e- Pearson
- H.Taub & D.Shilling, Digital Integrated Electronics- McGraw Hill.

7. Course Outcomes (CO):

After going through this course the Students will be able to:

Course Outcomes	Details/Statement	ActionVerb	KnowledgeLevel
IT 393.1	To understand the working principle and designing of amplifier, oscillator and Schmitt trigger	Understand, Design	Understand, Create
IT 393.2	To design various types of combinational circuits with the help of basic logic gates	Identify, Design Implement,	Apply, Create
IT 393.3	To construct various types of sequential circuits using logic gates	Implement,	Create

IT 393.4	Develop Synchronous and Asynchronous counters for various digital applications.	Realize	Apply
IT 393.5	Design and test DAC circuits using R2R Ladder Techniques.	Identify, Implement, Design	Apply, Create
IT 393.6	To study Digital to Analog Converter.	Explain, Realize	Understand, Apply

8. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	-	-	-
2	3	-	-	-	-	-
3	3	-	-	-	-	-
4	-	3	-	-	-	-
5	-	3	-	-	-	-
6	-	-	3	-	-	-
7	-	-	3	3	-	-
8	-	-	3	3	-	-
9	-	-	3	-	-	-
10	-	-	3	-	3	3
11	2	2	2	2	2	2

9. Mapping of the Course outcomes to Program Outcomes

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

***** End of Syllabus*****

Course Name: Problem Solving using python LAB
Course Code: IT-394
(Semester –III)
Course Broad Category: Professional Core Course

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1. Course Prerequisite:

- Basic knowledge of computers and mathematics

2. Course Learning Objectives:

I. **Develop problem-solving skills** by implementing python programming concepts.
II. **Application Of Problem-Solving** – Apply programming concepts to solve real-world problems

3. Teaching methodology and evaluation system for the course:

Teaching methodology –Lectures and Presentations, Interactive Discussions and Case Studies.

Evaluation System –

A. Internal Assessment (60 Marks)- Formative Continuous Assessment
B. End-Semester Exam (40 Marks)- Summative Assessment.

4. Course Content:

Course Name: Problem Solving using Python Lab
Course Code: IT-394
Hours per Week: 0L:0T: 4P
Credits: 2

Unit	Content
1	**Introduction** History,Features,Setting path, Working with Python,BasicSyntax,VariableandData Types, Operator
2	**Conditional Statements** If,If-else, Nestedif-else,Looping,For,While,Nested loops
3	**Control Statements** Break,Continue,Pass

4	**StringManipulation** AccessingStrings, BasicOperations,Stringslices, Function andMethods
5	**Lists** Introduction,Accessing list,Operations,Workingwithlists,Functionand Methods
6	**Tuple** Introduction,Accessing tuples,Operations,Working,Functionsand Methods
7	**Dictionaries** Introduction,Accessingvaluesin dictionaries,Working withdictionaries,Properties
8	**Functions** Definingafunction,Callingafunction,Typesoffunctions,FunctionArguments, Anonymous functions, Global and local variables
9	**Modules** Importing module, Math module, Random module, Packages, Composition, file open and close,file read and write ,web application framework,python databases Django,Flask,python libraries for database management MySQLdb,SQLLite3
10	**Object oriented Programming &ExceptionHandling** Exception,ExceptionHandling,Exceptclause,Try?finallyclause, UserDefinedExceptions
11	Introduction of Numpy,Matplotlib,Pandas and use in minor project.
12	Minor/Major Project /application development ,apply to solve real world problems.

5. References:

1. **Text & References Books:**
   AlSweigart,"AutomatetheBoringStuffwithPython",WilliamPollock,2015, ISBN: 978-1593275990.

ReferenceBooks:

1. AllenB. Downey, "ThinkPython:How toThink Like aComputer Scientist",2nd Edition, Green Tea Press, 2015, ISBN: 978-9352134755.
2. Charles Dierbach, "Introduction to Computer Science Using Python", 1st Edition, Wiley India Pvt Ltd. ISBN-13: 978-8126556014.
3. WesleyJChun,"CorePythonApplicationsProgramming",3rdEdition,PearsonEducation India, 2015. ISBN-13: 978-9332555365.
4. RobertoTamassia,MichaelHGoldwasser,MichaelTGoodrich,"DataStructuresand AlgorithmsinPython",1stEdition,WileyIndiaPvtLtd,2016.ISBN-13:978-8126562176.
5. ReemaThareja,"PythonProgrammingusingproblemsolvingapproach",OxfordUniversit y press, 2017. ISBN-13: 978-0199480173

6. CharlesR.Severance,"PythonforEverybody:ExploringDataUsingPython3", 1st Edition, Shroff Publishers, 2017. ISBN: 978-9352136278.

WebReference:

https://infytq.infosys.com/

6. Course Outcomes (CO):

After going through this course the Students will be able to:

Course Outcomes	Details	ActionVerb	Knowledge Level
IT-394.CO1	Learn the syntax and semantics of Python Programming Language, perform basic operation in command mode.	Understand	L-2
IT-394.CO2	Write, test and debug python programs using loop using script or file mode	Apply	L-3
IT-394.CO3	Use functions and represent Compound data using string,Lists, Tuples and Dictionaries write python programs	Apply	L-3
IT-394.CO4	Articulate the concepts of object oriented programming like exception handling.	Analyze	L-4
IT-394.CO5	Use of different libraries and modules, functions and python packages and import packages and learn to write program using numpy,matplotlib,pandas for development	Evaluating, Create	L-5,L-6
IT-394.CO6	Create or implement minor project or apps development using python	Create	L-6

7. Mapping of course outcomes to module / course content

Unit	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	-	-	-
2	-	3	-	-	-	-
3, 4, 5,6,7	-	-	3	-	-	-
8	-	-	-	3	-	-
9, 10	-	-	-	-	3	-
11, 12	-	-	-	-	-	3

8. Mapping of the Course outcomes to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	-

CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	3	2	-	-	-	-	-	-	-	-
CO4	3	3	3	2	-	-	-	-	-	-	-	-
CO5	3	3	3	2	-	-	-	-	2	-	-	-
CO6	3	3	3	2	-	-	-	-	2	-	-	-
AVG.	3	3	3	2	0	0	0	0	2	0	0	0

9. Mapping to Program Specific Outcomes (PSO)

	PSO1	**PSO2**	**PSO3**	**PSO4**
CO1	3	2	2	-
CO2	3	3	2	-
CO3	3	3	3	-
CO4	3	3	3	-
CO5	3	3	3	1
CO6	3	3	3	1

***** End of Syllabus*****

Course Title: Soft Skills Laboratory – I
Course Code: IT-395
Credits: 1 (0-0-2)
Semester: 3rd Semester
Prerequisites: None

Course Objectives:

- To introduce and develop basic soft skills necessary for academic and workplace success.
- To enhance communication, interpersonal, and presentation skills.
- To build confidence in public speaking, teamwork, and professional behaviour.
- To promote critical thinking and self-awareness.

Course Outcomes (COs):

By the end of the course, students will be able to:

CO1: Demonstrate effective verbal and non-verbal communication in academic and social contexts.
CO2: Participate actively and confidently in group discussions and collaborative tasks.
CO3: Deliver structured presentations with clarity and confidence.
CO4: Apply interpersonal skills such as active listening, empathy, and assertiveness in real-life scenarios.
CO5: Recognize and manage emotions to develop emotional intelligence in team settings.
CO6: Prepare professional documents such as resumes and formal emails using appropriate language and tone.

List of Practical Sessions / Modules (Total: 12 sessions, 2 hrs./week)

Session No.	Topic	Activities
1	Introduction to Soft Skills	Ice-breakers, self-introduction, personality mapping
2	Communication Skills – I	Listening skills, verbal/non-verbal communication
3	Communication Skills – II	Group discussions, barriers to communication

Session No.	Topic	Activities
4	Public Speaking Skills	Extempore, JAM (Just a Minute), storytelling
5	Presentation Skills – I	Preparing effective presentations (structure, visual aids)
6	Presentation Skills – II	Individual presentations and peer feedback
7	Teamwork and Collaboration	Group tasks, trust-building games, role plays
8	Interpersonal Skills	Conflict resolution, assertiveness training
9	Emotional Intelligence	Self-awareness activities, empathy development
10	Time & Stress Management	Prioritization techniques, stress busters
11	Resume Writing & Email Etiquette	Hands-on resume drafting, formal email writing
12	Mock Interviews & Feedback	One-on-one mock interviews with evaluation

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Textbook / Reference Materials:

1. **Developing Soft Skills** by Krishna Mohan & Meera Banerji – Pearson
2. **Soft Skills: Enhancing Employability** by Ghosh, M.S. – McGraw-Hill
3. **Business Communication** – M. Ashraf Rizvi, McGraw-Hill Education
4. **Online resources and video lectures** (TED Talks, etc.)

Course Outcomes (CO):

Course Outcomes	Details / Statement	Action Verb	Knowledge Level
IT-395.**CO1**	Demonstrate effective verbal and non-verbal communication in academic and social contexts.	Demonstrate	Application
IT-395.**CO2**	Participate actively and confidently in group discussions and collaborative tasks.	Participate	Application
IT-395.**CO3**	Deliver structured presentations with clarity and confidence.	Deliver	Synthesis
IT-395.**CO4**	Apply interpersonal skills such as active	Apply	Application

	listening, empathy, and assertiveness in real-life scenarios.		
IT-395.**CO5**	Recognize and manage emotions to develop emotional intelligence in team settings.	Recognize and manage	Analysis
IT-395.**CO6**	Prepare professional documents such as resumes and formal emails using appropriate language and tone.	Prepare	Application

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Mapping of Course Outcomes to Module / Course Content

Module	CO 1	CO 2	CO 3	CO 4	CO 5	CO 6
1. Introduction to Soft Skills	✓	✓		✓		
2. Communication Skills – I	✓	✓		✓		
3. Communication Skills – II	✓	✓		✓		
4. Public Speaking Skills	✓		✓	✓		
5. Presentation Skills – I	✓		✓	✓		✓
6. Presentation Skills – II	✓	✓	✓	✓		✓
7. Teamwork and Collaboration		✓		✓	✓	
8. Interpersonal Skills		✓		✓	✓	
9. Emotional Intelligence				✓	✓	
10. Time & Stress Management		✓		✓	✓	
11. Resume Writing & Email Etiquette				✓		✓
12. Mock Interviews & Feedback		✓	✓	✓		✓

Mapping of the Course outcomes to Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1												
CO 2												
CO 3												
CO 4												
CO 5												
CO 6												

Mapping to Program Specific Outcome (PSO)

	POS 1	POS 2	POS 3	POS 4
CO 1				
CO 2				
CO 3				
CO 4				
CO 5				
CO 6				

===== THE END =====