



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject code: 3150004

Subject Name: Contributor Personality Development Program

Semester V

Type of course: Work-Personality Development

Rationale: The Contributor Program aims to accomplish the following outcomes in the lives of students–

- Improve the employability of students by giving them the right work ethic and thinking that employers are looking for.
- Build their confidence with which they can go into any job and contribute meaningfully.
- Improve their ability to engage better in the workplace and to be able to handle the challenges that come up there.
- Build their career-worthiness and help them develop into future-ready contributors with ability to navigate a career in a volatile, changing world.
- Widen their choices of career and success, so that they are able to open up more opportunities for themselves and take up unconventional career pathways.
- Enable them to recognize how they, as technical professionals, can participate and make a positive contribution to their communities and to their state.

Towards this goal, the Contributor Program has been designed to awaken and strengthen students from within, in terms of building positive self-esteem, increasing their confidence level and I-can attitude, improving their aspirations, giving them new methods of thinking, building their cognitive capacities, exposing them to the skills and practices associated with being contributors in the workplace (not mere employees).

The Program content is also designed to expose students to real-world workplace scenarios and sensitize them to some of the challenges faced in society around them, especially in the local communities around them and in their own state of Gujarat.

The Contributor Program syllabus has been evolved and fine-tuned over several years, (a) to address the changing need and contemporary challenges being faced by industry and what employers of today are looking for in the people they hire and (b) by working extensively with universities and students building an appreciation of their challenges and concerns. At the core, the program is guided by the higher ideas and principles of practical Vedanta in work.

Teaching and Examination Scheme per semester:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE (E)	PA (M)	ESE (V)	PA (I)		
2	0	0	2	70	30	30	20	150

Note:

- Weekly 2 hours of Classroom facilitated sessions are planned which include Solutioning and Self-discovery sessions.



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- In addition, there will be individual/ team projects as part of Practicals. Students can do this on their own, with faculty as guide.

Note:

It is the responsibility of the institute heads that marks for PA of theory & ESE and PA of practical for each student are entered online into the GTU Portal at the end of each semester within the dates specified by GTU.

Content:

Sr. No.	Content	Total Hrs
1	The Contributor Work Ideal <i>In this topic, students explore what is their “ideal” of work - is the ideal to be a “worker” or to be a “contributor”? For example, an employee who has the ideal of a “worker” goes to work to pass time, earn a living, get benefits; in contrast to an employee with the ideal of a “contributor” who wants to make a difference, get things done well, create value for the company. This enables students to transform their expectation of themselves in work</i>	1.5 hrs Classroom engagement (including self-discovery/ solutioning sessions)
2	Identity & Self-esteem <i>In this topic, students engage with the question “who am I?” or on what basis do they define themselves. Is their identity defined by what others think of them (extrinsic self-esteem) or by what they think of themselves (intrinsic self-esteem)? Further, they discover positive identities that lead to intrinsic self-esteem, such as an I-can identity based on one’s capacity and inner strength. This enables them to build confidence and self-esteem.</i>	Same as above
3	Become a Creator of one’s destiny <i>In a “victim stance”, we see the career environment as full of difficulties and hurdles. We feel powerless or blame our circumstances for not having many opportunities. This makes us fearful of uncertainty and makes us settle for jobs where we remain mediocre. In this topic, students discover the “creator of destiny stance” to challenges and situations. This stance frees them to try out new things, open up new possibilities, take on responsibility, see the opportunity hidden in their environment.</i>	Same as above
4	Achieving Sustainable Success <i>In this topic, students discover how to achieve sustainable or lasting success, by building one’s “engine of success”, making them successful. Where their focus shifts to building one’s “engine of success” rather than being on chasing the “fruits of success”. This is important,</i>	Same as above



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	<i>because over a lifetime of work, all people go through ups and downs – where the fruits are not in their control. People who are focused on the fruits of success, fall prey to disappointment, loss in motivation, quitting too early, trying to find shortcuts – when fruits don't come. Whereas people focused on building their engine of success continue to contribute steadily, irrespective of whether fruits come or not. And with a strong engine of success, fruits come to them in time.</i>	
5	Career Development Models <i>In this topic, students explore a range of diverse “career development models” and the possibilities for contribution each opens up to them (e.g. start-up career model, change-maker career model, etc.). This opens their mind to different and even unconventional career models possible, beyond the usual (such as “stable large company career model” where one gets an engineering degree, then MBA, then get a job in a large company). This frees them from a herd mentality when making career choices.</i>	Same as above
6	Expanding contribution in every role <i>In this topic, students explore the many roles they can play in their life & discover the power they have to expand the contribution possible in any role. (E.g. role of student, role of manager, role of a project site engineer). So, the potential of a role is in the individual's hands. This opens their mind to an alternative way of career growth.</i>	Same as above

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks (for B.Pharma)					
R Level	U Level	A Level	N Level	E Level	C Level
-	15	20	-	25	20

Distribution of Theory Marks (for B.E., Diploma, MCA)					
R Level	U Level	A Level	N Level	E Level	C Level
-	15	15	-	20	20

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Reference resources:

A. Basic reference for both students and teachers

- Contributor Personality Program textbook cum workbook developed by Illumine



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2. Web-based ActivGuide™ for self-exploration of rich media resources to vividly understand many of the ideas, watch role models, learn from industry people, get reference readings – that help them enrich the understanding they gained in the class published by Illumine Foundation

B. Advanced reference for teachers

1. On Contributors, Srinivas V.; Illumine Ideas, 2011
2. Enlightened Citizenship and Democracy; Swami Ranganathananda, Bharatiya Vidya Bhavan, 1989
3. Eternal Values for a Changing Society – Vol I-IV, Swami Ranganathananda; Bharatiya Vidya Bhavan
4. Karma Yoga, Swami Vivekananda; Advaita Ashrama
5. Vivekananda: His Call to the Nation, Swami Vivekananda; Advaita Ashrama
6. Six Pillars of Self Esteem, Nathaniel Branden; Bantam, 1995
7. Mindset: The New Psychology of Success, Carol S. Dweck; Random House Publishing Group, 2007
8. Lasting Contribution: How to Think, Plan, and Act to Accomplish Meaningful Work, Tad Waddington; Agate Publishing, 2007
9. Why not?: how to use everyday ingenuity to solve problems big and small, Barry Nalebuff, Ian Ayres; Harvard Business School Press, 2003
10. The value mindset: returning to the first principles of capitalist enterprise (Ch 8 & 9); Erik Stern, Mike Hutchinson; John Wiley and Sons, 2004
11. The Power of Full Engagement: Managing Energy, Not Time, is the Key to High Performance and Personal Renewal, Jim Loehr, Tony Schwartz; Simon and Schuster, 2003
12. Creating Shared Value, Michael E. Porter and Mark R. Kramer; Harvard Business Review; Jan/Feb2011, Vol. 89 Issue 1/2
13. The Speed of Trust: The One Thing That Changes Everything, Stephen M. R. Covey, Rebecca R. Merrill, Stephen R. Covey; Free Press, 2008
14. The Courage to Meet the Demands of Reality, Henry Cloud; HarperCollins, 2009
15. Responsibility at work: how leading professionals act (or don't act) responsibly, Howard Gardner; John Wiley & Sons, 2007

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
Outcome of theory sessions		
CO-1	Students will be able to recognize & appreciate two alternative ideals of work – ideal of a “worker” and ideal of a “contributor”. And why organizations of today expect people they employ to be contributors and not just workers.	10-12%
CO-2	Students will be able to recognize & appreciate alternative ways in which they could define themselves or “who am I” (their identity) – and which are positive identities that will lead to building intrinsic self-esteem and confidence in oneself; in contrast to identities that will lead to extrinsic self-esteem that makes them	10-12%



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	more dependent on their environment.	
CO-3	Students will be able to recognize & appreciate a “victim” stance as distinct from a “creator of destiny” stance in the way people approach challenges and situations; and how the latter frees individuals to take on challenges and open up opportunities.	10-12%
CO-4	Students will be able to differentiate between two alternative approaches to success - ‘building one’s engine of success’ and ‘chasing the fruits of success’; they also appreciate the payoffs/ consequences of both and which is more likely to lead to sustainable or lasting success in the long run.	10-12%
CO-5	Students will be able to recognize & appreciate different career models and their value; to help them make more informed career-related choices.	10-12%
CO-6	Students will be able to recognize & appreciate how one can expand the contribution possible in any role, thereby opening up an alternative way of career growth to them.	10-12%
Outcome of practical sessions		
CO-7	Students learn to re-interpret their life and college experiences to showcase their contribution affinities which are relevant for employers.	15%
CO-8	Students learn to apply contributor thinking to real-world or career relevant challenges.	15%



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Bachelor of Engineering

Subject Code: 3150005

Semester – V

Subject Name: INTEGRATED PERSONALITY DEVELOPMENT COURSE

Type of Course –

Value-based holistic personality development course for university students.

Rationale -

This course aims to help a person understand and know his / her purpose in life, get a positive thought pattern, gain confidence, improve behaviour, learn better communication and develop a healthy physique with morality and ethics in its core.

Today youth lack the guidance to face insecurity about their health and career, premature relationships and family breakdown, addictions and substance abuse, negative impact of internet and social media etc. This course includes such topics that will cover all aspects and provide solution to the current challenges through creative and interactive activities.

This course will allow students to enjoy, understand and practice invaluable lessons preparing them for a successful future.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE (E)	PA (M)	ESE (V)	PA (I)		
2	0	0	70	30	30	20	150	

Content:

Lecture No.	Content	Hours
IPDC-1 (Semester-1)		
1	Remaking Yourself - Restructuring Yourself	2
2	Remaking Yourself - Power of Habit	2
3	Learning from Legends - Tendulkar & Tata	2
4	Mass Management - Project Management	2
5	From House to Home - Affectionate Relationships	2
6	Facing Failures - Factors Affecting Failures	2
7	Facing Failures - Failures are not Always Bad	2



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8	Remaking Yourself - Being Addiction-Free	2
9	Soft Skills - Teamwork & Harmony	2
10	Remaking Yourself - Handling the Devil - Social Media	2
11	From House to Home - Forgive & Forget	2
12	From House to Home - Listening & Understanding	2
13	Financial Wisdom - Basics of Financial Planning	2
14	Soft Skills - Networking - Decision Making - Leadership	2
15	Review Lecture - Student Voice-1	2

BASIC STUDY MATERIAL / MAIN COURSE WORK-BOOK -

1. IPDC Workbook-I
2. IPDC Workbook-II

IPDC REFERENCES –

- *These are the reference material for each lectures of IPDC.*

Module No.	Module/ Course Topics	Lectures	References
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1	Facing Failures	Factors Affecting Failures Failures are not Always Bad Insignificance of Failures Power of Faith Practicing Faith	<ol style="list-style-type: none">1. Thomas Edison's factory burns down, New York Times Archives, Page 1, 10/12/19142. Lincoln Financial Foundation, Abraham Lincoln's "Failures": Critiques, Forgotten Books, 20173. J.K. Rowling Harvard Commencement Speech Harvard University Commencement, 20084. Born Again on the Mountain: A Story of Losing Everything and Finding It Back, Arunima Sinha, Penguin, 20145. Failing Forward: Turning Mistakes Into Stepping Stones for Success, John C. Maxwell, Thomas Nelson, 20076. Steve Jobs: The Exclusive Biography Paperback, Walter Isaacson, Abacus, 2015
2	Learning from Legends	Tendulkar & Tata Leading Without Leading	<ol style="list-style-type: none">1. Chase Your Dreams: My Autobiography, Sachin Tendulkar, Hachette India, 20172. Playing It My Way: My Autobiography, Sachin Tendulkar, Hodder & Stoughton, 20143. The Wit and Wisdom of Ratan Tata, Ratan Tata, Hay House, 20184. The Tata Group: From Torchbearers to Trailblazers, Shashank Shah, Penguin Portfolio, 20185. The Leader Who Had No Title, Robin Sharma, Jaico Publishing House, 20106. In the Joy of Others: A Life Sketch of Pramukh Swami Maharaj, Mohanlal Patel and BAPS Sadhus, Swaminarayan Aksharpath, 2013
3	Mass Management	Project Management	<ol style="list-style-type: none">1. Project Management Absolute Beginner's Guide, Gregory Horine, Que Publishing, 20172. The Fast Forward MBA in Project Management, Eric Verzuh, Wiley, 20113. Guide to Project Management: Getting it right and achieving lasting benefit, Paul Roberts, Wiley, 2013



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4	My India My Pride	<p>Glorious Past - Part 1 Glorious Past - Part 2 Present Scenario An Ideal Citizen - 1 An Ideal Citizen - 2 An Ideal Citizen - 3</p>	<ol style="list-style-type: none"> 1. Hidden Horizons, Dr. David Frawley and Dr. Navaratna S. Rajaram, 2006 2. Rishis, Mystics and Heroes of India, Sadhu Mukundcharandas, Swaminarayan Aksharpath, 2011 3. Physics in Ancient India, Narayan Dongre, Shankar Nene, National Book Trust, 2016 4. The Rise of Civilization in India and Pakistan, Raymond Allchin, Bridget Allchin, Cambridge University Press, 1982 5. The Āryabhaṭīya of Āryabhaṭa: An Ancient Indian Work on Mathematics and Astronomy (1930), Walter Eugene Clark, University of Chicago Press, reprint, Kessinger Publishing, 2006
5	Remaking Yourself	<p>Restructuring Yourself Power of Habit Being Addiction-Free Begin with the End in Mind Handling the Devil – Social Media</p>	<ol style="list-style-type: none"> 1. Power of Habit, Charles Duhigg, Random House Trade Paperbacks, 2014 2. Change Your Habit, Change Your Life, Tom Corley, North Loop Books, 2016 3. The Seven Habits of Highly Effective People, Stephen Covey, Simon & Schuster, 2013 4. Seven Habits of Highly Effective Teens, Sean Covey, Simon & Schuster, 2012 5. Atomic Habits, James Clear, Random House, 2018 6. How a handful of tech companies control billions of minds every day, Tristan Harris, TED Talk, 2017
6	Financial Wisdom	<p>Basics of Financial Planning Financial Planning Process</p>	<ol style="list-style-type: none"> 1. Rich Dad Poor Dad, Robert Kiyosaki, Plata Publishing, 2017 2. The Warren Buffett Way, Robert Hagstrom, Wiley, 2013 3. The Intelligent Investor, Benjamin Graham, Harper Business, 2006 4. Yogic Wealth: The Wealth That Gives Bliss, Gaurav Mashruwala, TV18 Broadcast Ltd, 2016
7	From House to Home	<p>Affectionate Relationships Forgive & Forget Listening & Understanding Bonding the Family</p>	<ol style="list-style-type: none"> 1. “What Makes a Good Life? Lessons from the Longest Study on Happiness”, R. Waldinger, Ted Talks, 2015 2. Long Walk To Freedom, Nelson Mandela, Back Bay Books, 1995 3. Outliers, Malcolm Gladwell, Back Bay Books, 2011



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8	Soft Skills	Teamwork & Harmony Networking - Decision Making - Leadership	<ol style="list-style-type: none">1. The 17 Indisputable Laws of Teamwork, John Maxwell, HarperCollins, 20132. Team of Teams: New Rules of Engagement for a Complex World, Stanley McChrystal, Portfolio, 20153. Predictably Irrational, Revised and Expanded Edition: The Hidden Forces That Shape Our Decisions, Harper Perennial, Dan Ariely, 2010
9	Review	Student Voice – 1 Student Voice – 2 Words of Wim	

Course Outcomes:

- To provide students with a holistic education – focused on increasing their intelligence quotient, physical quotient, emotional quotient and spiritual quotient.
- To provide students with hard and soft skills, making them more marketable when entering the workforce.
- To educate students on their social responsibilities as citizens of India and have a greater sense of social responsibility.
- To provide students with a value-based education which will enable them to be successful in their family, professional, and social relationships by improving their moral and ethical values.
- To teach self-analysis and self-improvement exercises to enhance the potential of the participants.
- To have a broader sense of self-confidence and a defined identity.



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3150703

ANALYSIS AND DESIGN OF ALGORITHMS

Semester V

Type of course: NA

Prerequisite: Programming (C or C++), Data and file structure

Rationale: Obtaining efficient algorithms is very important in modern computer engineering as the world wants applications to be time and space and energy efficient. This course enables to understand and analyze efficient algorithms for various applications.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE(E)	PA	ESE (V)	PA(I)		
4	0	2	5	70	30	30	20	150

Content:

Sr No	Course content	Total Hrs	% Weightage
1	Basics of Algorithms and Mathematics: What is an algorithm?, Mathematics for Algorithmic Sets, Functions and Relations, Vectors and Matrices, Linear Inequalities and Linear Equations.	02	2
2	Analysis of Algorithm: The efficient algorithm, Average, Best and worst case analysis, Amortized analysis, Asymptotic Notations, Analyzing control statement, Loop invariant and the correctness of the algorithm, Sorting Algorithms and analysis: Bubble sort, Selection sort, Insertion sort, Shell sort Heap sort, Sorting in linear time: Bucket sort, Radix sort and Counting sort	08	20
3	Divide and Conquer Algorithm: Introduction, Recurrence and different methods to solve recurrence, Multiplying large Integers Problem, Problem Solving using divide and conquer algorithm - Binary Search, Max-Min problem, Sorting (Merge Sort, Quick Sort), Matrix Multiplication, Exponential.	06	15
4	Dynamic Programming: Introduction, The Principle of Optimality, Problem Solving using Dynamic Programming – Calculating the Binomial Coefficient, Making Change Problem, Assembly Line-Scheduling, Knapsack problem, All Points Shortest path, Matrix chain multiplication, Longest Common Subsequence.	05	15
5	Greedy Algorithm General Characteristics of greedy algorithms, Problem solving using Greedy Algorithm - Activity selection problem, Elements of Greedy Strategy, Minimum Spanning trees (Kruskal's algorithm, Prim's algorithm), Graphs: Shortest paths, The Knapsack Problem, Job Scheduling Problem, Huffman code.	05	15
6	Exploring Graphs:	04	10



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	An introduction using graphs and games, Undirected Graph, Directed Graph, Traversing Graphs, Depth First Search, Breath First Search, Topological sort, Connected components,		
7	Backtracking and Branch and Bound: Introduction, The Eight queens problem , Knapsack problem, Travelling Salesman problem, Minimax principle	03	6
8	String Matching: Introduction, The naive string matching algorithm, The Rabin-Karp algorithm, String Matching with finite automata, The Knuth-Morris-Pratt algorithm.	03	6
9	Introduction to NP-Completeness: The class P and NP, Polynomial reduction, NP- Completeness Problem, NP-Hard Problems. Travelling Salesman problem, Hamiltonian problem, Approximation algorithms, Randomized algorithms, Class of problems beyond NP – P SPACE	05	11

Suggested Specification table with Marks (Theory):70

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	30	10	10	5	5

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, PHI.
2. Fundamentals of Algorithms – E. Horowitz et al.
3. Fundamental of Algorithms by Gills Brassard, Paul Bratley, PHI.
4. Introduction to Design and Analysis of Algorithms, Anany Levitin, Pearson.
5. Foundations of Algorithms, Shailesh R Sathe, Penram
6. Design and Analysis of Algorithms, Dave and Dave, Pearson.

Course Outcome:

After learning the course the students should be able to:

1. Analyze the asymptotic performance of algorithms.
2. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
3. Find optimal solution by applying various methods.
4. Apply pattern matching algorithms to find particular pattern.
5. Differentiate polynomial and nonpolynomial problems.
6. Explain the major graph algorithms and their analyses. Employ graphs to model engineering problems, when appropriate.



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List of Experiments:

1. Implementation and Time analysis of sorting algorithms.
Bubble sort, Selection sort, Insertion sort, Merge sort and Quicksort
2. Implementation and Time analysis of linear and binary search algorithm.
3. Implementation of max-heap sort algorithm
4. Implementation and Time analysis of factorial program using iterative and recursive method
5. Implementation of a knapsack problem using dynamic programming.
6. Implementation of chain matrix multiplication using dynamic programming.
7. Implementation of making a change problem using dynamic programming
8. Implementation of a knapsack problem using greedy algorithm
9. Implementation of Graph and Searching (DFS and BFS).
10. Implement prim's algorithm
11. Implement kruskal's algorithm.
12. Implement LCS problem.

Design based Problems (DP)/Open Ended Problem:

1. From the given string find maximum size possible palindrome sequence
2. Explore the application of Knapsack in human resource selection and courier loading system using dynamic programming and greedy algorithm
3. BRTS route design, considering traffic, traffic on road, and benefits

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3150713

Semester – V

Subject Name: Python for Data Science

Type of course: Open elective

Prerequisite: Programming concepts, Statistical and numerical methods

Rationale: The data collected by organization needs insights to take the decisions, for predictions as well as for finding hidden patterns inside the data. Python is an appropriate language supporting all the features and libraries to perform data science activates. This subject covers the overview of the python with emphasis on various python data structures and various libraries like Pandas, NumPy, Matplotlib for performing various data science function including data preparation, cleaning, exploratory analysis and visualization

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE (E)	PA (M)	ESE (V)	PA (I)		
2	0	2	3	70	30	30	20	150

Contents:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	Overview of Python and Data Structures: Basics of Python including data types, variables, expressions, objects and functions. Python data structures including String, Array, List, Tuple, Set, Dictionary and operations them.	06	20
2	Data Science and Python: Discovering the match between data science and python: Defining the Sexiest Job of the 21st Century, Considering the emergence of data science, Outlining the core competencies of a data scientist, Linking data science, big data, and AI, Understanding the role of programming, Creating the Data Science Pipeline, Preparing the data, Performing exploratory data analysis, Learning from data, Visualizing, Obtaining insights and data products, Understanding Python's Role in Data Science, Considering the shifting profile of data scientists, Working with a multipurpose, simple, and efficient language, Learning to Use Python Fast ,Loading data, Training a model, Viewing a result. Introducing Python's Capabilities and Wonders: Why Python?, Grasping Python's Core Philosophy, Contributing to data science, Discovering present and future development goals, Working with Python, Getting a taste of the language, Understanding the need for indentation, Working at the command line or in the IDE, Performing Rapid Prototyping and Experimentation, Considering Speed of Execution, Visualizing Power, Using the Python Ecosystem for Data Science, Accessing scientific tools using SciPy, Performing fundamental scientific computing using NumPy, Performing data analysis using pandas, Implementing machine learning using Scikit-learn, Going for deep learning with Keras and TensorFlow, Plotting the data using	04	15



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	matplotlib, Creating graphs with NetworkX, Parsing HTML documents using Beautiful Soup.		
3	<p>Getting Your Hands Dirty With Data:</p> <p>Understanding the tools:</p> <p>Using the Jupyter Console, Interacting with screen text, Changing the window appearance, Getting Python help, Getting IPython help, Using magic functions, Discovering objects, Using Jupyter Notebook, Working with styles, Restarting the kernel, Restoring a checkpoint, Performing Multimedia and Graphic Integration, Embedding plots and other images, Loading examples from online sites, Obtaining online graphics and multimedia.</p> <p>Working with Real Data:</p> <p>Uploading, Streaming, and Sampling Data, Uploading small amounts of data into memory, Streaming large amounts of data into memory, Generating variations on image data, Sampling data in different ways, Accessing Data in Structured Flat-File Form ,Reading from a text file Reading CSV delimited format, Reading Excel and other Microsoft Office files, Sending Data in Unstructured File Form, Managing Data from Relational Databases, Interacting with Data from NoSQL Databases, Accessing Data from the Web.</p> <p>Conditioning Your Data:</p> <p>Juggling between NumPy and pandas, Knowing when to use NumPy, Knowing when to use pandas, Validating Your Data, Figuring out what's in your data, Removing duplicates, Creating a data map and data plan, Manipulating Categorical Variables, Creating categorical variables, Renaming levels, Combining levels, Dealing with Dates in Your Data, Formatting date and time values, Using the right time transformation, Dealing with Missing Data, Finding the missing data, Encoding missingness, Imputing missing data, Slicing and Dicing: Filtering and Selecting Data, Slicing rows, Slicing columns, Dicing, Concatenating and Transforming, Adding new cases and variables, Removing data, Sorting and shuffling, Aggregating Data at Any Level.</p> <p>Shaping Data:</p> <p>Working with HTML Pages, Parsing XML and HTML, Using XPath for data extraction, Working with Raw Text, Dealing with Unicode, Stemming and removing stop words, Introducing regular expressions, Using the Bag of Words Model and Beyond, Understanding the bag of words model, Working with n-grams, Implementing TF-IDF transformations, Working with Graph Data, Understanding the adjacency matrix, Using NetworkX basics.</p>	10	30
4	<p>Data Visualization:</p> <p>Visualizing Information:</p> <p>Starting with a Graph, Defining the plot, Drawing multiple lines and plots, Saving your work to disk, Setting the Axis, Ticks, Grids, Getting the axes, Formatting the axes, Adding grids, Defining the Line Appearance, Working with line style, Using colors, Adding markers, Using Labels, Annotations, and Legends, Adding labels, Annotating the chart, Creating a legend.</p>	04	15



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	<p>Visualizing the Data: Choosing the Right Graph, Showing parts of a whole with pie charts, Creating comparisons with bar charts, Showing distributions using histograms, Depicting groups using boxplots, Seeing data patterns using scatterplots, Creating Advanced Scatterplots, Depicting groups, Showing correlations, Plotting Time Series, Representing time on axes, Plotting trends over time, Plotting Geographical Data, Using an environment in Notebook, Getting the Basemap toolkit, Dealing with deprecated library issues, Using Basemap to plot geographic data, Visualizing Graphs, Developing undirected graphs, Developing directed graphs.</p>		
5	<p>Data Wrangling:</p> <hr/> <p>Wrangling Data: Playing with Scikit-learn, Understanding classes in Scikit-learn, Defining applications for data science, Performing the Hashing Trick, Using hash functions, Demonstrating the hashing trick, Working with deterministic selection, Considering Timing and Performance, Benchmarkin, with,timeit, Working with the memory profiler, Running in Parallel on Multiple Cores, Performing multicore parallelism, Demonstrating multiprocessing.</p> <p>Exploring Data Analysis: The EDA Approach, Defining Descriptive Statistics for Numeric Data, Measuring central tendency,Measuring variance and range ,Working with percentiles, Defining measures of normality, Counting for Categorical Data, Understanding frequencies, Creating contingency tables, Creating Applied Visualization for EDA ,Inspecting boxplots, Performing t-tests after boxplots, Observing parallel coordinates, Graphing distributions, Plotting scatterplots ,Understanding Correlation, Using covariance and correlation, Using nonparametric correlation, Considering the chi-square test for tables ,Modifying Data Distributions, Using different statistical distributions, Creating a Z-score standardization, Transforming other notable distributions.</p>	06	20

Reference Books:

1. Python for data science for dummies 2nd Edition, John Paul Mueller, Luca Massaron, Wiley
2. Programming through Python, M. T. Savaliya, R. K. Maurya, G. M. Magar, STAREDU Solutions
3. Pandas for everyone :Python Data Analysis, Daniel Y. Chen, Pearson
4. Introducing Data Science: Big Data, Machine Learning, and More, Using Python Tools, Davy Cielen, Arno D.B. Meysman, et al., Minning
5. Applied Data Science with Python and Jupyter: Use powerful industry-standard tools to unlock new, actionable insights from your data, , Packt
6. Data Analytics, Anil Maheshwari , McGrawHill
7. Data Science From Scratch: First Principles with Python, Joel Grus , SPD
8. Star Data Science Specialist, STAR CERTIFICATION



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3150713

Course Outcomes:

Sr. No.	CO Statement	Marks % weightage
CO-1	Apply various Python data structures to effectively manage various types of data.	20
CO-2	Explore various steps of data science pipeline with role of Python.	15
CO-3	Design applications applying various operations for data cleansing and transformation.	30
CO-4	Use various data visualization tools for effective interpretations and insights of data.	15
CO-5	Perform data Wrangling with Scikit-learn applying exploratory data analysis.	20

List of Practical:

Practical should be performed by students based on

- Use of Python Data Structures
- Using NumPy and Panda for Data Analysis
- Matplotlib for Visualization

Web Resources:

- www.anaconda.com
- www.python.org
- www.w3schools.com
- <https://www.learnpython.org/>
-



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3150714

Semester – V

Subject Name: Cyber Security

Type of course: Undergraduate (Open Elective)

Prerequisite: None

Rationale: In this digital age, the information and data are immense and need to be secured. The cyber crimes have increased as attackers see it as gaining big rewards. There is a need to examine the cyber attack patterns and provide security measures for them and also need to learn the cyber laws formed to effectively act upon cyber crimes.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
2	0	2	3	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs	Marks Weight age (%)
1	Systems Vulnerability Scanning Overview of vulnerability scanning, Open Port / Service Identification, Banner / Version Check, Traffic Probe, Vulnerability Probe, Vulnerability Examples, OpenVAS, Metasploit. Networks Vulnerability Scanning - Netcat, Socat, understanding Port and Services tools - Datapipe, Fpipe, WinRelay, Network Reconnaissance – Nmap, THC-Amap and System tools. Network Sniffers and Injection tools – Tcpdump and Windump, Wireshark, Ettercap, Hping Kismet	08	25
2	Network Defense tools Firewalls and Packet Filters: Firewall Basics, Packet Filter Vs Firewall, Packet Characteristic to Filter, Stateless Vs Stateful Firewalls, Network Address Translation (NAT) and Port Forwarding, Snort: Introduction Detection System	06	25
3	Web Application Tools Scanning for web vulnerabilities tools: Nikto, W3af, HTTP utilities - Curl, OpenSSL and Stunnel, Application Inspection tools – Zed Attack Proxy, Sqlmap, DVWA, Webgoat, Password Cracking and Brute-Force Tools – John the Ripper, LOhtcrack, Pwdump, HTC-Hydra	06	25
4	Introduction to Cyber Crime and law Cyber Crimes, Types of Cybercrime, Hacking, Attack vectors, Cyberspace and Criminal Behavior, Clarification of Terms, Traditional Problems Associated with Computer Crime, Introduction to Incident Response, Digital Forensics, Realms of the Cyber world, Recognizing and Defining Computer Crime, Contemporary Crimes, Contaminants and Destruction of Data, Indian IT ACT 2000.	03	10
5	Introduction to Cyber Crime Investigation Keyloggers and Spyware, Virus and Worms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer	05	15



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3150714

Overflow, Attack on wireless Networks.		
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Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	30	20	--	--	--

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Course Outcomes: Students will be able to

Sr. No.	CO statement	Marks % weightage
CO-1	Describe system and web vulnerability.	40
CO-2	Evaluate network defence tools.	30
CO-3	Understand the cyber laws	10
CO-4	Investigate a cybercrime, prepare report and apply laws for the case	20

Reference Books:

1. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole and Sunit Belpure, Publication Wiley
2. Cyber Security and Cyber Laws Paperback – 2018 by Alfred Basta, Nadine Basta , Mary Brown , Ravinder Kumar, publication Cengage
3. 3. Anti-Hacker Tool Kit (Indian Edition) by Mike Shema, Publication Mc Graw Hill.
4. Cyber security and laws – An Introduction, Madhumita Chaterjee, Sangita Chaudhary, Gaurav Sharma, Staredu Solutions

List of Open Source Software/learning website:

www.wireshark.org

List of Practical:

1. Install Kali Linux. Examine the utilities and tools available in Kali Linux and find out which tool is the best for finding cyber attack/vulnerability.
2. Evaluate network defense tools for following
 - (i) IP spoofing
 - (ii) DOS attack
3. Explore the Nmap tool and list how it can be used for network defence.
4. Explore the NetCat tool.
5. Use Wireshark tool and explore the packet format and content at each OSI layer.
6. Examine SQL injection attack.



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7. Perform SQL injection with SQLMap on vulnerable website found using google dorks.

GTUQuestionPapers.com



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8. Examine software keyloggers and hardware keyloggers.
9. Perform online attacks and offline attacks of password cracking.
10. Consider a case study of cyber crime, where the attacker has performed on line credit card fraud. Prepare a report and also list the laws that will be implemented on attacker..

GTUQuestionPapers.com



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3151605

Semester – V

Subject Name: Formal Language and Automata Theory

Type of Course: NA

Prerequisite: Knowledge in mathematics, including a course in discrete mathematics, and in programming.

Rationale: To introduce students the basic concepts in theoretical computer science, and the formal relationships among machines, languages and grammars and computational problems. The course should in addition clarify the practical view towards the applications of these ideas in engineering.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Hours	% Weightage
1	Introduction to Finite Automata: Introduction to Finite Automata, Central Concepts of Automata Theory, Deterministic Finite Automata (DFA), Nondeterministic Finite Automata (NFA), Finite Automata with Epsilon Transition.	9	19
2	Regular Expressions and Languages: Regular Expressions, Finite Automata and Regular Expressions, Applications of Regular Expressions, Proving Languages Not to Be Regular, Closure Properties of Regular Languages, Equivalence and Minimization of Automata – Pumping Lemma.	6	12
3	Context Free Grammars and Languages Parse Trees: Applications of Context Free Grammars, Ambiguity in Grammars and Languages, Eliminating Useless Symbols, Computing the Generating and Reachable Symbols, Eliminating Epsilon Productions, Eliminating Unit Productions, BackusNaur Form (BNF), Chomsky Normal Form (CNF).	9	19
4	Pushdown Automata, CFL and NCFL: Definition of the Pushdown Automaton (PDA), The Languages of a PDA, Equivalence of PDA's and CFG's, Deterministic Pushdown Automata, The Pumping Lemma for Context Free Languages, Closure Properties of Context Free Languages, Pumping lemma for CFL, Intersections and Complements of CFL, Non-CFL	9	19
5	Turing Machine (TM): Problems That Computers Cannot Solve, The	9	19



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Subject Code: 3151605

	Turing Machine, Programming Techniques for Turing Machines ,Extensions to the Basic Turing Machine, Restricted Turing Machines , Turing Machines and Computers , Definition of Post’s Correspondence Problem, A Language That Is Not Recursively Enumerable, An Undecidable Problem That Is RE, Context sensitive languages and Chomsky hierarchy, Other Undecidable Problems		
6	Computable Functions: Partial, total, constant functions, Primitive Recursive Functions, Bounded Minimization, Regular function, Recursive Functions	6	12

Course outcomes: Students will be able to

Sr. No.	CO Statement	Marks % weightage
1.	Apply the knowledge of automata theory, grammars & regular expressions for solving the problem	25
2.	Analyse the give automata, regular expression & grammar to know the language it represents	20
3.	Design Automata & Grammar for pattern recognition and syntax checking	25
4.	To distinguish between decidability and undecidability of problems	15
5.	Identify limitations of some computational models and possible methods of proving them	15

Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	30	20	20	15	5

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom’s Taxonomy)

Text and References

1. Automata Theory, Languages, and Computation By John Hopcroft, Rajeev Motowani, and Jeffrey Ullman
2. Elements of the Theory of Computation, Harry R. Lewis and Christos H. Papadimitriou, Pearson Education Asia.
3. Introduction to the Theory of Computation By Michael Sipser, Thomson Course Technology



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4. Introduction to Languages and Automata Theory By John C Martin, Tata McGraw-Hill
5. An introduction to automata theory and formal languages By Adesh K. Pandey, Publisher: S. K. Kataria & Sons
6. Introduction to computer theory By Deniel I. Cohen , Joh Wiley & Sons, Inc
7. Computation: Finite and Infinite By Marvin L. Minsky Prentice-Hall
8. Compiler Design By Alfred V Aho, Addison Wesley

List of Practical:

JFLAP is recommended for the design of practicals..

List of Open Source Software/learning website:

1. http://en.wikipedia.org/wiki/Theory_of_computation
2. <http://meru.cecs.missouri.edu/courses/cecs341/tc.html>
3. <https://www.coursera.org/courses?query=theory%20of%20computation>
4. nptel.ac.in/courses/106104028/theory_of_computation.
5. <https://lagunita.stanford.edu/courses/course-v1:ComputerScience+Automata+SelfPaced/about>

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GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3151910

Semester – V

Subject Name: Operation Research

Type of course: Humanities and Social Science

Prerequisite: Nil

Rationale:

Operations Research now a day widely used in the area of decision making for the real life problems. Managers and decision makers get idea for optimizing and approximating industrial problems. They not only strive to devise appropriate measures for problem solving but also apply scientific techniques to monitor the organizations ongoing activities such as Production mix, Transportation, Assignment, Queuing, Game theory, Replacement and Project Management problem.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	0	3	70	30	0	0	100

Content:

Sr. No.	Content	Total Hrs
1	<p>Operations Research: Origin of Operation Research, Historical Standpoint, Methodology, Different Phases, Characteristics, Scope and Application of Operations Research.</p> <p>Linear Programming Problem: Introduction, Requirement of LP, Basic Assumptions, Formulation of LP, General Statement of LP, Solution techniques of LP: Graphical Methods, Analytical Methods: Simplex, Big M and Two Phase, Special Case of LP Problem, Graphical Sensitivity Analysis.</p> <p>Introduction of Primal and Dual Problems, Economic Interpretation. Introduction of Goal and Integer Programming.</p> <p>Dynamic Programming: Steps involved in dynamic programming, characteristics and explanation of dynamic programming, formulation of Deterministic and probabilistic dynamic programming.</p>	12
2	<p>Transportation and Assignment: Transportation Problems definition, Linear form, Solution methods: North west corner method, least cost method, Vogel's approximation method. Degeneracy in transportation, Modified Distribution method, Unbalanced problems and profit maximization problems. Transshipment Problems. Assignment Problems and Travelling sales man Problem.</p>	09
3	<p>Queuing Theory: Basis of Queuing theory, elements of queuing theory, Kendall's Notation, Operating characteristics of a queuing system, Classification of Queuing models, Preliminary</p>	04



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	examples of M/M/1:∞/∞/FCFS.	
4	Replacement theory: Introduction, Replacement of capital equipment which depreciated with time, replacement by alternative equipment, Group and individual replacement policy.	04
5	Game Theory: Introduction, Characteristics of Game Theory, Two Person, Zero sum games, Pure strategy. Dominance theory, Mixed strategies (2x2, M x2), Algebraic and graphical methods.	04
6	Decision Theory: Introduction, Decision under certainty, Decision under risk, Decision under uncertainty: Laplace criterion, MaxiMin criterion, MiniMax criterion, savage MiniMax regret criterion, Hurwicz criterion, Decision tree.	04
7	Project Management: Introduction to PERT and CPM, Critical Path calculation, float calculation and its importance. Cost reduction by Crashing of activity.	08
	Total Hours	45

Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	10	30	30	20	--

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Operations Research: An Introduction by HamdyTaha, Pearson Education Inc
2. Operations Research: Principles and Practice by Pradeep PrabhakarPai, Oxford Higher Education, Oxford University press
3. Operations Research: Principles and Practice by Ravindran Phillips and Solberg by Wiley India Edition,
4. Operations Research by P Mariappan, Pearson
5. Operations Research by A M Natarajan, P Balasubramani, A Tamilarasi, Pearson Education Inc
6. Operations Research by H N Wagner, Prentice hall.
7. Optimization in Operations Research by Ronald Rardin, Pearson Education Inc.
8. Operations Research by R. Paneerselvam, Prentice Hall of India Pvt. Ltd.
9. Quantitative Techniques in Management by N D Vohra, Tata McGraw-Hill



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3151910

Course Outcomes:After learning the course the students will be able to:

Sr. No.	CO statement	Marks % weightage
CO-1	Develop models for optimizing the management and production systems from the verbal description of the real system.	10
CO-2	Make use of LPP techniques for optimization of Production mix problem in industry.	20
CO-3	Evaluate transportation, transshipment, assignment and travelling salesman and Queuing problem.	30
CO-4	Apply quantitative techniques in machine replacement, game theory, business decision making under conditions of certainty, risk and uncertainty.	20
CO-5	Demonstrate Project management Problem.	20

Term Work:

The term work shall be based on the topics mentioned above.

1. Industrial Problems of Linear Programming
2. Industrial Problems on Transportation
3. Industrial Problems on Assignment
4. Industrial Problems on Queuing
5. Industrial Problems on PERT and CPM



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3153203

SUBJECT: Object Oriented Programming with Java

SEMESTER – V

Type of course: Professional Core

Prerequisite: none

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE (E)	PA	ESE (V)	PA (I)		
4	0	2	5	70	30	30	20	150

Contents:

Sr. No.	Content	Total Hrs	% Weightage
1	Unit-1: Basics of Java Features of Java, Byte Code and Java Virtual Machine, JDK, Data types, Operator, Control Statements – If , else, nested if, if-else ladders, Switch, while, do-while, for, for-each, break, continue. Single and Multidimensional Array, String class, StringBuffer class, Operations on string, Command line argument, Use of Wrapper Class.	5	10
2	Unit-2: Classes, Objects and Methods Class, Object, Object reference, Constructor, Constructor Overloading, Method Overloading, Recursion, Passing and Returning object form Method, new operator, this and static keyword, finalize() method, Access control, modifiers, Nested class, Inner class, Anonymous inner class, Abstract class.	6	15
3	Unit-3: Inheritance and Interfaces Use of Inheritance, Inheriting Data members and Methods, constructor in inheritance, Multilevel Inheritance – method overriding Handle multilevel constructors – super keyword, Stop Inheritance - Final keywords, Creation and Implementation of an interface, Interface reference, instanceof operator, Interface inheritance, Dynamic method dispatch , Understanding of Java Object Class, Comparison between Abstract Class and interface, Understanding of System.out.println – statements.	7	12
4	Unit-4: Package and Exception Handling Use of Package, CLASSPATH, Import statement, Static import, Access control, Exception and Error, Use of try, catch, throw, throws and finally, Built in Exception, Custom exception, Throwable Class.	6	12
5	Unit-5: Multithreaded Programming Use of Multithread programming, Thread class and Runnable interface , Thread priority, Thread synchronization, Thread communication, Deadlock	5	5
6	Unit-6: IO Programming Introduction to Stream, Byte Stream, Character stream, Readers and Writers, File Class, File InputStream, File Output Stream, InputStreamReader, OutputStreamWriter, FileReader, FileWriter, Buffered Reader	5	10
7	Unit-7: Collection Classes and Networking List, ArrayList, LinkedList, Enumeration, Vector, Properties, Introduction to Java.util package InetAddress class, Socket class, DatagramSocket class, DatagramPacket class	4	6



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8	Unit-8: Introduction to Object orientation and Class Modeling Modeling as a Design Technique Modeling Concepts, abstraction, The three models, Class Model, State model and Interaction model. Object and class concepts, link and association, Generalization and Inheritance, Advanced Object and class concepts, Association Ends, N-ary associations, aggregation, abstract classes, multiple inheritance, Metadata, Constraints, Derived data, Packages.	5	12
10	Unit-9: State modeling, Interaction Modeling Events, states, Transition and conditions, state diagram, state diagram behavior, Use case Models, sequence models, activity models	7	18
Total		50	100

Suggested Specification table* with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	45	10	5	--	--

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

**This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary from above table.*

Reference Books:

1. Java Fundamentals A comprehensive introduction By Herbert Schildt and Dale Skrien, McGraw Hill.
2. Programming with Java - A Primer By E.Balaguruswamy, Tata McGraw Hill.
3. The Complete Reference, Java 2 (Fourth Edition) By Herbert Schild, Tata McGraw Hill.
4. Core Java Volume-I Fundamentals (Eight Edition) By Horstmann and Cornell, Pearson Education
5. Object Oriented Modeling and Design with UML (Second Edition) By Michael Blaha and James Rumbaugh, Pearson Education
6. UML Distilled: A Brief Guide to the Standard Object Modeling Language (3rd Edition) By Martin Fowler

Course Outcomes: Students will be able to

Sr. No.	CO Statement	Marks % Weightage
1	Understand object oriented programming concepts and its implementation in java.	30
2	Understand and apply Multithreading, Exception handling, Networking concepts in real world problems	30
3	Understand packages, collection classes, IO programming	20
4	Understand and prepare UML diagram for the software system	20

List of Experiments:

1. Write a program to convert rupees to dollar. 60 rupees=1 dollar.
2. Write a program that calculate percentage marks of the student if marks of 6 subjects are given.
3. Write a program to enter two numbers and perform mathematical operations on them.
4. Write a program to find length of string and print second half of the string.



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5. Write a program to accept a line and check how many consonants and vowels are there in line.
6. Write a program to count the number of words that start with capital letters.
7. Write a program to find that given number or string is palindrome or not.
8. Create a class which ask the user to enter a sentence, and it should display count of each vowel type in the sentence. The program should continue till user enters a word “quit”. Display the total count of each vowel for all sentences.
9. Write an interactive program to print a string entered in a pyramid form. For instance, the string “stream” has to be displayed as follows:

```
S
S t
S t r
S t r e
S t r e a
S t r e a m
```

10. Write an interactive program to print a diamond shape. For example, if user enters the number 3, the diamond will be as follows:

```
*
* *
* * *
* *
*
```

11. Create a class called Student. Write a student manager program to manipulate the student information from files by using FileInputStream and FileOutputStream
12. Refine the student manager program to manipulate the student information from files by using the BufferedReader and BufferedWriter
13. Refine the student manager program to manipulate the student information from files by using the DataInputStream and DataOutputStream. Assume suitable data
14. Prepare a class diagram for given group of classes using multiplicity, generalization, association concepts. And add at least 5-7 attributes and 3-5 operations for particular class Page, Shape, Point, Line, Arc, Ellipse, Rectangle, Circle
15. Prepare a class diagram for given group of classes using multiplicity, generalization, association concepts. And add at least 5-7 attributes and 3-5 operations for particular class. City, Airport, Airline, Pilot, Flight, Plane, Seat, Passenger
16. Categorize the following relationships into generalization, aggregation or association.
[A] A country has a capital city
[B] A dining philosopher uses a fork
[C] A file is an ordinary file or a directory file
[D] Files contains records
[E] A polygon is composed of an ordered set of points
[F] A drawing object is text, a geometrical object, or a group
[G] A person uses a computer language on a object
[H] Modems and keyboards are input/output devices
[I] Classes may have several attributes
[J] A person plays for a team in a certain year
[K] A route connects two cities
[L] A student takes a course from a professor
17. Prepare a state diagram for an interactive diagram editor for selecting and dragging objects
18. Prepare a use case diagram and sequence diagram for a computer email system



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19. Prepare an activity diagram for computing a restaurant bill, there should be charge for each delivered item. The total amount should be subject to tax and service charge of 18% for group of six and more. For smaller groups there should be a blank entry. Any coupons or gift certificates submitted by the customer should be subtracted
20. Prepare a sequence diagram for issuing a book in the library management system

Design based Problems (DP)/Open Ended Problem:

- 1) Remove duplicate lines from a large text or given document.
- 2) Write a program to compute if one string is a rotation of another. For example, pit is rotation of tip as pit has same character as tip.

List of Open Source Software/learning website:

1. Java
2. NPTEL Videos
3. Java Development Kit: <http://www.oracle.com/technetwork/java/javase/downloads/index.html>
4. <http://docs.oracle.com/javase/specs/jls/se7/html/index.html>
5. <http://docs.oracle.com/javase/tutorial/java/index.html>
6. <http://www.javatpoint.com/>
7. <http://www.tutorialspoint.com/java/>
8. <http://www.learnjavaonline.org/>
9. <http://www.c4learn.com/javaprogramming/>
10. <http://www.learn-java-tutorial.com/>
11. <http://www.tutorialspoint.com/uml/>
12. <http://www.uml.org/>



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3153204

SUBJECT: Advanced Network Protocols

SEMESTER – V

Type of course: Professional Core Elective

Prerequisite: Fundamental of Computer networks, basics of Programming

Rationale: The course will provide strong foundation on signals and systems which will be useful for creating foundation of communication and signal processing. The students will learn basic continuous time and discrete time signals and systems. Student will understand application of various transforms for analysis of signals and systems both continuous time and discrete time. Students will also explore effect of sampling on spectrum of signal.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE (E)	PA	ESE (V)	PA (I)		
3	0	2	4	70	30	30	20	150

Contents:

Sr. No.	Content	Total Hrs	% Weightage
1	Overview of TCP/IP protocols & Application layer services: HTTP, HTTP-HTTPS, SMTP, FTP, DNS	5	15
2	MAC protocols for high-speed LANS, MANs, and wireless LANs: FDDI, Gigabit ethernet, Wireless Ethernet	6	15
3	IPv6: Why IPv6, basic protocol, extensions and options, support for QoS, security, etc., neighbour discovery, auto-configuration, routing. Changes to other protocols. Application Programming Interface for IPv6. 6bone.	6	12
4	ATM : Introduction, basic concepts of ATM, ATM layers, ATM adaptation layer, QoS, IP over ATM	6	12
5	Routing in Internet: Intradomain routing(RIP, OSPF), Interdomain routing(BGP), Multicast routing	6	15
6	Network Management and service: Introduction to Network Management, Standard Network Management Protocol	4	7
7	Multimedia over Internet: IP Multicasting, Transmission of Multimedia over the Internet, RSVP, RTP, VOIP	4	10
8	TCP extensions for high-speed networks, Various TCP flavors	5	10
9	Introduction to Software defined Networks: Data Plane, Control Plane, Application Plane, Controller design, Virtualization	3	4
Total		45	100

Suggested Specification table* with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level



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20	20	15	5	5	5
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Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

**This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary from above table.*

Books:

1. James Kurose and Keith Ross, Computer Networking: A Top-Down Approach, Pearson
2. High-Speed Networks and Internets, Performance and Quality of Service, William Stallings, Pearson
3. TCP/IP Protocol Suite by Behrouz A. Forouzan
4. W. R. Stevens.TCP/IP Illustrated, Volume 1: The protocols,Addison Wesley.
5. G. R. Wright.TCP/IP Illustrated, Volume 2: The Implementation,Addison Wesley.
6. Data Communications and Networking, 5th edition, by Behrouz A. Forouzan

Course Outcomes: Students will be able to

Sr. No.	CO Statement	Marks % Weightage
1	Learn basics network services and its usage	20
2	Understand the differences between local area networks and Internet	20
3	Understand and apply various routing mechanism and Management services in the network	20
4	Understand alternate TCP/IP architecture like ATM also analyze the Quality of service	20
5	Understand multimedia traffic handling and explore current trends in Network technology	20

List of Experiments:

1. DNS utility command understanding: dig, host, nslookup
2. To study about IPv4 and IPv6 addresses.
3. Installation of Linux (MANDRIVA / OPEN SUSE 10 GNOME Tool).
4. Introduction and installation of Network Simulator (NS-2.30).
5. To study about simple TCL example in NS2.
6. Calculate & plot the graph of throughput for simple.tcl by using NS2 (AWK script).
7. To study about TCP Flavors and their comparison in NS2.
8. To create wireless topology for five nodes using NS2.
9. To create wired cum wireless topology using NS2.
10. Introduction to Bluetooth.

Design based Problems (DP)/Open Ended Problem:

1. Router installation and study of specifications and Router configuration of campus/institute
2. Prepare the presentation and report on different network.
3. Learning of Linux commands for network

Major Equipment:

1. Linux based computer system



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2. Network simulator software

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.

GTUQuestionPapers.com



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3153205

SUBJECT: Signal and Systems

SEMESTER – V

Type of course: Professional Core Elective

Prerequisite: Differential equations, Transform methodologies, Electrical circuits and networks

Rationale: The course will provide strong foundation on signals and systems which will be useful for creating foundation of communication and signal processing. The students will learn basic continuous time and discrete time signals and systems. Student will understand application of various transforms for analysis of signals and systems both continuous time and discrete time. Students will also explore effect of sampling on spectrum of signal.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Contents:

Sr. No.	Content	Total Hrs	% Weightage
1	Introduction to Signals & Systems: Basic definitions of signals and systems, Basic elementary signals, Classification of signals and systems. Signal operations and properties. Basic continuous time signals, Basic system properties, Case study of different signal.	4	10
2	Behavior of Continuous time (CT)& Discrete Time(DT) Linear Time Invariant (LTI) System: Impulse response characterization and convolution for CT- LTI and DT-LTI systems, Properties of LTI systems, LTI systems characterized by Differential and difference equations.	12	25
3	Introduction to Fourier Series, Fourier Transform: Fourier Series Representation of periodic Signals, Fourier series, Waveform Symmetries, Calculation of Fourier Coefficients, Frequency spectrum of aperiodic signals, Fourier Transform, Relation between Laplace Transform and Fourier Transform. Properties of Continuous Time Fourier transform. System Analysis using Fourier Transform. Introduction to DTFT and DFT.	12	25
4	Z Transform: The z-Transform, Convergence of z-Transform, , Properties of z-Transform, Inverse z-Transform , LTI System analysis from Linear Constant Coefficient Difference Equations using z-Transform.	12	25
5	Sampling & Reconstruction: Representation of digital signals, The Sampling Theorem, Sampling with a zero order hold, Reconstruction of a signal from its samples using interpolation, Aliasing and its effects.	5	15
Total		45	100

Suggested Specification table* with Marks (Theory):

Distribution of Theory Marks



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R Level	U Level	A Level	N Level	E Level	C Level
15	20	25	10	--	--

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

**This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary from above table.*

Books:

1. Signal and Systems By Anand Kumar, 3rd Edition, PHI
2. Signals and Systems by Alan V. Oppenheim, Alan S. Wilsky and Nawab, Prentice Hall
3. Signals and Systems by K. Gopalan, Cengage Learning (India Edition)
4. Signals and Systems by Michal J. Roberts and Govind Sharma, Tata Mc-Graw Hill Publications
5. Signals and Systems by Simon Haykin and Bary Van Veen, Wiley-India Publications
6. Linear Systems and Signals by B.P.Lathi, Oxford University Press
7. Signal, Systems and Transforms by Charles L. Philips, J. M. Parr and E. A. Riskin, Pearson Education
8. Digital Signal Processing Fundamentals and Applications by Li Tan, Elsevier, Academic Press

Course Outcomes: Students will be able to

Sr. No.	CO Statement	Marks % Weightage
1	understand about various types of signals, classify them, analyze them, and perform various operations on them.	20
2	understand about various types of systems, classify them, analyze them and understand their response behavior.	20
3	explore use of transforms in analysis of signals and system.	25
4	apply simulation on signals and systems for observing effects of applying various properties and operations.	25
5	analyze various signals and sequences	10

List of Experiments:

1. Generations and capturing various continuous time signals from sensors.
2. Generation and capturing of discrete time signals and plot them.
3. Discretization using different sampling rate and observing aliasing effect.
4. Observing the effects of lower sampling rate and higher sampling rate on CT signal.
5. Performing various operations on the signal using circuits and computational software.
6. Using digital circuit building block to perform operations on signals.
7. Simulation of continuous time LTI system.
8. Simulation of discrete time LTI systems.
9. Obtaining impulse response of the systems.
10. Computing FT and DTFT of the CT signals and DT sequences.

Open Ended Problems:

1. Design of active noise removal / cancellation circuit.
2. Design of digital building blocks to perform various operations on discrete time sequences and signals.



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3. Design of efficient and accurate signal converter.
4. Design of sample and hold circuits
5. Design of anti aliasing filter.

Major Equipments:

Computers, analog circuit blocks, digital circuit blocks, signal generators, digital storage oscilloscope and spectrum analyser

List of Open Source Software/learning website:

1. SEQUEL
2. SCILAB
3. NPTEL Videos
4. MIT open course ware website
5. MATLAB

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