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	C	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.

- 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** *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*	1.5 hrs Classroom engagement *(including self-discovery/ solutioning sessions)*
2	**Identity & Self-esteem** *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.*	Same as above
3	**Become a Creator of one's destiny** *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.*	Same as above
4	**Achieving Sustainable Success** *In this topic, students discover how to achieve sustainable or lasting success, by building one's "engine of success", making them success-worthy. Where their focus shifts to building one's "engine of success" rather than being on chasing the "fruits of success". This is important,*	Same as above

		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.	
5	**Career Development Models** *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.*		Same as above
6	**Expanding contribution in every role** *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.*		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

   1. Contributor Personality Program textbook cum workbook developed by Illumine

2. Web-based ActivGuide^{TM} 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%

	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%

w.e.f. AY 2019-20

GUJARAT TECHNOLOGICAL UNIVERSITY

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	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
2	0	0	2	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

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

1	Facing Failures	Factors Affecting Failures Failures are not Always Bad Insignificance of Failures Power of Faith Practicing Faith	1. Thomas Edison's factory burns down, New York Times Archives, Page 1, 10/12/1914 2. Lincoln Financial Foundation, Abraham Lincoln's "Failures": Critiques, Forgotten Books, 2017 3. J.K. Rowling Harvard Commencement Speech | Harvard University Commencement, 2008 4. Born Again on the Mountain: A Story of Losing Everything and Finding It Back, Arunima Sinha, Penguin, 2014 5. Failing Forward: Turning Mistakes Into Stepping Stones for Success, John C. Maxwell, Thomas Nelson, 2007 6. Steve Jobs: The Exclusive Biography Paperback, Walter Isaacson, Abacus, 2015
2	Learning from Legends	Tendulkar & Tata Leading Without Leading	1. Chase Your Dreams: My Autobiography, Sachin Tendulkar, Hachette India, 2017 2. Playing It My Way: My Autobiography, Sachin Tendulkar, Hodder & Stoughton, 2014 3. The Wit and Wisdom of Ratan Tata, Ratan Tata, Hay House, 2018 4. The Tata Group: From Torchbearers to Trailblazers, Shashank Shah, Penguin Portfolio, 2018 5. The Leader Who Had No Title, Robin Sharma, Jaico Publishing House, 2010 6. In the Joy of Others: A Life Sketch of Pramukh Swami Maharaj, Mohanlal Patel and BAPS Sadhus, Swaminarayan Aksharpith, 2013
3	Mass Management	Project Management	1. Project Management Absolute Beginner's Guide, Gregory Horine, Que Publishing, 2017 2. The Fast Forward MBA in Project Management, Eric Verzuh, Wiley, 2011 3. Guide to Project Management: Getting it right and achieving lasting benefit, Paul Roberts, Wiley, 2013

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4	My India My Pride	Glorious Past - Part 1 Glorious Past - Part 2 Present Scenario An Ideal Citizen - 1 An Ideal Citizen - 2 An Ideal Citizen - 3	1. Hidden Horizons, Dr. David Frawley and Dr. Navaratna S. Rajaram, 2006 2. Rishis, Mystics and Heroes of India, Sadhu Mukundcharandas, Swaminarayan Aksharpith, 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	Restructuring Yourself Power of Habit Being Addiction-Free Begin with the End in Mind Handling the Devil – Social Media	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	Basics of Financial Planning Financial Planning Process	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	Affectionate Relationships Forgive & Forget Listening & Understanding Bonding the Family	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 | 1. The 17 Indisputable Laws of Teamwork, John Maxwell, HarperCollins, 2013
2. Team of Teams: New Rules of Engagement for a Complex World, Stanley McChrystal, Portfolio, 2015
3. 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.

w.e.f. AY 2018-19

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	C	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	%Wei ghtage
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.

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.

Type of course: NA

Prerequisite: NA

Rationale:

Teaching and Examination Scheme:

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

Content:

Sr. No.	Content	Total Hrs
1	Concepts and theories of Business Ethics: Definitions of Ethics, Personal ethics and Business ethics, Morality and law, How are moral standards formed? Religion and Morality, Morality, Etiquette and Professional codes, Indian Ethical Traditions.	6
2	Business Ethics: Principles of personal Ethics, Principles of Professional ethics, Evolution of Ethics Over the years, Honesty, Integrity and Transparency are the touchstones of Business Ethics, Distinction Between Values and Ethics, Roots of unethical Behaviour, Ethical Decision – Making	6
3	Ethical Dilemmas, Sources and Their resolutions: What is an Ethical Dilemma, Sources of Ethical Behaviour, Code of Personal Ethics for Employees, How to Resolve an Ethical Problem, How to Resolve Ethical Dilemmas.	5
4	Ethical Decision – marking in Business: Ethical Models that Guide Decision making, Which Approach to use, Ethical Decision Marking with Cross – holder conflicts and competition, Applying Moral Philosophy to Ethical Decision Making, Kohlberg's Model of Cognitive Moral Development, Influences on Ethical Decision Making, Personal values and Ethical Decision Marking	10
5	Individual factors: Moral Philosophies and values – Moral Philosophy defined, Moral philosophies, Applying Moral Philosophy to Ethical decision Making, Cognitive moral Development, White – Collar Crime, Individual factors in Business Ethics	9
6	Human Values for Indian Managers, Lessons from Ancient Indian Education system, The law of Karma, Quality of Working life, Ethics of Vivekananda, Gandhiji, Aurobindo and Tagore.	9

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
25	20	10	25	20	0

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. Business Ethics by AC Fernando
2. Business Ethics by Ferrell, Fraedrich and Ferrell.
3. Ethics in Management and Indian Ethos by Biswanath Gosh

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

Sr. No.	CO statements	Marks %Weightage
CO-1	Awareness of types of ethical challenges and dilemmas confronting members of a range of professions (business, media, police, law, medicine, research)	25
CO-2	Identify and describe relevant theoretical concepts related to professional ethics in engineering	20
CO-3	Understand the basic perception of profession, professional ethics, various moral issues & uses of ethical theories	20
CO-4	Distinguish among morals, values, ethics, and the law and to explore how they each impact engineering practice	25
CO-5	Apply learning from Indian history and ethos to ethical practices in engineering.	10

GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3150710
Semester – V
Subject Name: Computer Networks

Type of course: Undergraduate

Prerequisite: Working experience of any one structured programming language

Teaching and Examination Scheme:

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

Syllabus:

Sr. No.	Content	Total Hrs	% Weightage
1	**Introduction to computer networks and Internet:** Understanding of network and Internet, The network edge, The network core, Understanding of Delay, Loss and Throughput in the packet-switching network, protocols layers and their service model, History of the computer network	08	15
2	**Application Layer:** Principles of computer applications, Web and HTTP, E-mail, DNS, Socket programming with TCP and UDP	09	17
3	**Transport Layer:** Introduction and transport layer services, Multiplexing and Demultiplexing, Connectionless transport (UDP), Principles of reliable data transfer, Connection-oriented transport (TCP), Congestion control, TCP congestion control	12	25
4	**Network Layer:** Introduction to forwarding and routing, Network Service models, Virtual and Datagram networks, study of router, IP protocol and addressing in the Internet, Routing algorithms, Broadcast and Multicast routing	13	25
5	**The Link layer and Local area networks:** Introduction to link layer services, error-detection and correction techniques, Multiple access protocols, addressing, Ethernet, switches, VLAN	10	18

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
14	28	14	7	7	0

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

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GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3150710

Course outcomes: Students will be able to

Sr. No.	CO statement	Marks % Weightage
1	**Explain** the basic terminologies used in networking and layered architecture of computer network.	15
2	**Comprehend** basic protocols of application layer and how they can be used to assist in network design and implementation.	17
3	**Describe and implement** the essential principles of a connectionless and connection-oriented protocols used for reliable data transfer, flow control and congestion control.	25
4	**Design** network architecture, assign IP addressing and **apply** various routing algorithms to find shortest paths for network-layer packet delivery.	25
5	**Illustrate** different link layer terminologies like error detection-correction, Multiple access protocol and Link layer addressing used in network.	18

Reference Books:

1. Computer Networking- A Top-Down approach (6th edition), Kurose and Ross, Pearson
2. Computer Networks- A Top-Down approach, Behrouz Forouzan, McGraw Hill
3. Computer Networks (5th edition), Andrew Tanenbaum, Prentice Hall
4. Computer Networking and the Internet (5th edition),Fred Halsall, Addison Wesley
5. Data Communications and Networking (5th edition), Behrouz Forouzan, McGraw Hill
6. TCP/IP Protocol Suite (4th edition), Behrouz Forouzan, McGraw Hill

List of Experiments:

1. Study of different network devices in detail.
2. Study of different types of network cables and practically implement the cross-wired cable and straight through cable using clamping tool.
3. Study of basic network command and Network configuration commands
4. Implement different LAN topologies using Network Simulator.
5. Implement the concept of VLAN using Network Simulator.
6. Implement the concept of static routing.
7. Implement the concept of dynamic routing (RIP, OSPF, BGP).
8. Packet capture and header analysis by wire-shark (TCP,UDP,IP)

List of Open Source Software/learning website:

1. http://swayam.gov.in/
2. https://www.netacad.com/courses/packet-tracer

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	Examination Marks				Total Marks
L	T	P	C	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 Weightage (%)
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, L0htcrack, 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 Warms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer	05	15

Overflow, Attack on wireless Networks.			

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.

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

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..

GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3151604
Semester – V
Subject Name: Object Oriented Analysis and Design

Type of course: Undergraduate (Open Elective)

Prerequisite: None

Rationale: Object oriented modeling and design promotes better understanding of requirements; clear designs and gives maintainable systems. A good design leads to better implementation of product and saves on time.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	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	Total Hrs	Marks Weightage (%)
1	Introduction OO orientation, OO development, OO themes, Usefulness of OO Development Modeling as a Design Technique Modeling, Abstraction, The Three models	02	10
2	Class Modeling Object and Class concepts, Link and Association Concepts, Generalization and inheritance, Class Model, Navigation of Class model Advanced class Modeling Advanced object and class concepts, Association Ends, N-ary Associations, Aggregation, Abstract classes, Multiple inheritance, Metadata, Reification, Constraints, Derived Data,Packages	12	25
3	State Modeling Events, States, Transitions and Conditions, State Diagrams, State Diagram behavior Advance State Modeling Nested state diagram, Nested states, Signal Generalization, Concurrency,State Model, Relation of class and State Models Interaction Modeling Use case models, Sequence Models, Activity Models Advanced interaction Modeling Use case relations, Procedural sequence Models, Special constructs of activity Models	12	25
4	Process Overview Development stages, Development life cycle	08	20

	System conception Developing a system concept, Elaborating a concept, preparing a Problem statement Domain Analysis Overview of analysis, Domain class model, domain state model, domain interaction model, Iterating the analysis Application Analysis Application Interaction model, Application Class model, Application State Model, Adding operations		
5	System Design Overview, Estimating performance, Making a reuse plan, breaking a system into subsystems, Identifying concurrency, Allocation of subsystems, Management of data storage, Handling global resources,Choosing a software control strategy, Handling boundary conditions, Setting trade off priorities,common architectural styles, Architecture of the ATM system Class Design Overview, gap , realizing use cases, Designing algorithms, Recursing downward, refactoring, Design optimization, Reification of behavior, Adjustment of inheritance, Organizing a class design, ATM example	08	20

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	**20**	**30**	**10**	**--**	**--**

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 the static structure of a system.	30
CO-2	Describe the aspects of a system that change over time as well as control behaviour.	15
CO-3	Describe how objects collaborate to achieve overall results.	15
CO-4	Formulate a model and device high level strategy for building a solution.	40

Reference Books:
1. **Object Oriented Modeling and design with UML , By Michael Blaha, James Rambaugh, Pearson**
2. **Object Oriented Analysis, Design and Implementation By Brahma Dathan, Sarnath Ramnath, University Press**
3. **Object Oriented Systems and Development By Ali Bahrami Tata McGrawHill Edition.**

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List of Practical:

1. Write an algorithm to draw ellipse and rectangle. Find out ellipse algorithm can be used for drawing circles and rectangle algorithm is suitable for squares. Implement the algorithm in OO language.

2. Prepare Pseudocode for following
   There are competitions organized in an event. Many participants have registered. There are judges in the event. (i) Register a competitor for event. (ii) schedule an event. Assign judges to the event. Implement the pesudocode to retrieve event with participants and judge for the event in OO language.

3. Describe the ATM model for login and balance verification and displaying mini statement. Implement the model in OO language.

4. Prepare a class diagram for a library checkout system that shows the late charges for an overdue book as a derived attribute. Implement this in OO language.

5. Prepare a state model to describe the function of digital watch with two buttons A and B. Pressing A button displays hours and minutes. Button B advances hours and minutes once each time it is pressed. Implement the model in OO language.

6. Prepare activity diagram for computing restaurant bill. The total amount should be subject to tax and service charge of 18%. Any coupons submitted by the customer should be subtracted. Implement the activities in OO language.

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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	Examination Marks				Total Marks
L	T	P	C	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, BacosNaur 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

	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 Mineralization, 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 Weslley

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: 3151606

Subject name: Web Development

Type of Course: NA

Prerequisite: Knowledge of basic HTML is required.

Rationale: In the era of digitization, the demand of Internet based applications is increasing day by day. To put students in the orbit of this Internet driven world and to make them comfortable in developing various web based applications, this course is focusing on front-end and Back-end design.

Teaching and Examination Scheme:

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

Syllabus:

Sr. No.	Content	Hours	% Weightage
1	**Introduction:** Basics of WWW, HTTP protocol methods and headers, HTTP Request and Response, Architecture of web browser, Web server installation and configuration, Web security, CORS, Understanding SEO	03	**5%**
2	**HTML & CSS:** HTML page structure, formatting tags in HTML, tables, links, images, meta tags, frames, html form tags, media, APIs, HTML5 tags in relation to validations and SEO. **CSS:** Need for CSS, Basic syntax and structure, Backgrounds, Colors and properties, Manipulating texts, Fonts, borders and boxes, Margins, Padding Lists, CSS2, CSS3, Animations, Tool-Tips, Style images, Variables, Flex Box, Media Queries, Wildcard Selectors (*, ^ and $) in CSS, Working with Gradients, Pseudo Class, Pseudo elements, basic of frameworks like Bootstrap, Responsive web design and Media Query, CSS variables	08	25%
3	**Java Script:** Javascript Syntax, Types of Javascript, variables, arrays, functions, conditions, loops, Pop up boxes, Javascript objects and DOM, Javascript inbuilt functions, Javascript validations, Regular expressions, Event handling with Javascript, Callbacks in Javascript, Function as arguments in Javascript, Object concepts in Javascript, JSON	10	25%

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4	**PHP Basics** Introduction to Server side programming , PHP **variables**, decision and looping with examples, PHP and HTML, Arrays, Functions, Browser control and detection, String, Form processing, File uploads, Dates and timezone, Working with Regular Expressions, Exception Handling, Working with JSON data, Object Oriented Programming with PHP	07	15%
5	**Session and State Management using PHP** Need of session management, Various techniques for state and session management like: Hidden Fields, Query String, Cookie and Session	03	5%
6	**Database Connectivity using PHP:** Basic commands for database connection and query execution with CURD examples, Object oriented database access using PHP	05	15%
7	**Advanced Concepts:** Asynchronous Web requests using AJAX, Creating REST API using PHP **JQuery:** Working with jQuery, Using plugins in jQuery and Creating Image slider, Generating charts from data using 3rd Party Libs	06	10%

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
7	14	21	7	7	14

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
1	**Understand** the concepts of WWW, HTTP protocol and client-server architecture.	5%
2	**Learn** and **apply** various HTML tags to **build** the user friendly web pages.	10%

3	**Explore** the new features of CSS to **define** and **apply** CSS rules in the web pages for rich User Interface.	15%
4	**Create** interactive web pages to improve the user experience using client side scripting with Javascript.	25%
5	**Design** and **develop** fully functional dynamic web applications using the concepts of PHP, MySQL,	35%
6	**Learn** and **apply** advanced asynchronous web communication mechanisms like REST API, AJAX and JQuery for building highly interactive webpages.	10%

Reference Books:
1. HTML 5 Black Book 2Ed, by Kogent Learning Solutions Inc.
2. Learning PHP, MySQL, JavaScript, CSS & HTML5, 3rd Edition
3. A Step-by-Step Guide to Creating Dynamic Websites By Robin Nixon Publisher: O'Reilly Media
3. JavaScript for impatient programmers by Dr. Axel Rauschmayer
4. PHP: The Complete Reference By Steven Holzner, McGrawhill

List of Experiments:

Practical list should be prepared based on the content of the subject with following guidelines in mind.
> 1. Entire syllabus should be covered.
> 2. Practical list should be designed with real life examples.
> 3. List should be prepared to cover individual concepts and integration of different concepts on real life problems.

List of e-Learning Resources:

Web Security and SEO:
https://www.tutorialspoint.com/seo/index.htm
https://github.com/vasanthk/web-security-basics

HTML:
https://developer.mozilla.org/en-US/docs/Web/HTML
https://www.w3schools.com/html/
https://www.tutorialspoint.com/html/index.htm

CSS:
https://developer.mozilla.org/en-US/docs/Web/CSS
https://www.manning.com/books/css-in-depth
https://www.w3schools.com/css/
https://www.tutorialspoint.com/css/index.htm

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Java Script:
https://javascript.info/
https://github.com/getify/You-Dont-Know-JS
https://www.w3schools.com/js/
https://www.tutorialspoint.com/javascript/index.htm

PHP:
https://www.w3schools.com/php/
https://www.tutorialspoint.com/php/index.htm

GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engineering
Subject Code: 3151607
Semester – V
Subject Name: Computer Graphics and Visualization

Type of Course: Professional Core Course

Prerequisite: Knowledge in Mathematics and basic programming skills.

Rationale:To introduce students with the basic concepts in computer graphics and visualizationand in addition to it clarify the practical view towards the applications of these ideas in engineering and technology.

Teaching and Examination Scheme:

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

Syllabus:

Sr. No.	Content	Hours
1	**Introduction:**History of computer graphics, applications, graphics pipeline, physical and synthetic images, synthetic camera, modeling, animation, rendering, relation to computer vision and image processing, review of basic mathematical objects (Points, Vectors, Matrixmethods).	
2	**Introduction to OpenGL:**OpenGL architecture, primitives and attributes, simple modeling and rendering of two- and three-dimensional geometric objects, indexed and RGB color models, frame buffer, double buffering, GLUT, interaction, events and callbacks,picking	
3	**Geometric Transformations:**Homogeneous coordinates, affine transformations (translation, rotation, scaling, shear), concatenation, matrix stacks and use of model view matrix in OpenGL for these operations	
4	**Viewing:**Classical three dimensional viewing, computer viewing, specifying views, parallel and perspective projective transformations; Visibility- z-Buffer, BSP trees, Open-GL culling, hidden-surface algorithms	
5	**Shading:**Light sources, illumination model, Gouraud and Phong shading for polygons. Rasterization- Line segment and polygon clipping, 3D clipping, scan conversion, polygonal fill, Bresenham's algorithm	
6	**Discrete Techniques:**Texture mapping, compositing, textures in OpenGL; Ray Tracing-Recursive ray tracer, ray-sphere intersection	
7	**Representation and Visualization:**Bezier curves and surfaces, B-splines, visualization, interpolation, marching squares algorithm	

Course outcomes: Students will be able to

Sr. No.	CO Statement	Marks % weightage
1.	**Understand** and **Apply** fundamental concepts within computer graphics such as geometrical transformations, illumination models, removal of hidden surfaces and rendering.	30

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2.	**Compare** and **Evaluate**the ideas in some fundamental algorithms for computer graphics	20
3.	**Apply** fundamental principles within interaction programming	30
4.	**Understand** fundamental concepts of information visualization and scientific visualization	20

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**	**35**	**10**	**10**	**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. Edward Angel, Interactive Computer Graphics. A Top-Down Approach Using OpenGL (fifth Edition), Pearson Education, 2008
2. Donald Hearn and Pauline Baker, Computer Graphics with OpenGL (third edition), Prentice Hall, 2003
3. F. S. Hill Jr. and S. M. Kelley, Computer Graphics using OpenGL (third edition), Prentice Hall, 2006
4. Peter Shirley and Steve Marschner, Computer Graphics (first edition), A. K. Peters, 2010.
5. James D Foley, Andries Van Dam, Steven K Feiner, John F Huges Computer graphics with OpenGL: pearson education
6. Xiang, Plastock : Computer Graphics, sham's outline series, 2nd edition, TMG.
7. Kelvin Sung, Peter Shirley, steven Baer : Interactive Computer Graphics, concepts and applications, Cengage Learning
8. M MRaiker, Computer Graphics using OpenGL, Filip learning/Elsevier

List of Practical:
The practical list shouldinclude minimum 10 practical's covering the complete syllabus.

List of Open Source Software/learning website:
1. https://www.opengl.org/
2. https://learnopengl.com/Getting-started/OpenGL
3. https://developer.nvidia.com/opengl

GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3151608
Semester – V
Subject Name: Data Science

Type of course: Undergraduate (Open Elective)

Prerequisite: None

Rationale: Available data need to be analyzed to make quicker and better decisions. Data science helps in managing, analyzing and understanding trends in data leading to design the strategy for better profitability and results.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	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 Weightage (%)
1	Introduction to Business Analytics Why Analytics Business Analytics: The Science of Data-Driven Decision Making Descriptive Analytics Predictive Analytics Prescriptive Analytics Descriptive, Predictive and Prescriptive Analytics Techniques Big Data Analytics Web and Social Media Analytics Machine Learning Algorithms Framework for Data-Driven Decision Making Analytics Capability Building Roadmap for Analytics Capability Building Challenges in Data-Driven Decision Making and Future	03	10
2	Descriptive Analytics Introduction to Descriptive Analytics Data Types and Scales Types of Data Measurement Scales Population and Sample Percentile, Decile and Quartile Measures of Variation Measures of Shape − Skewness and Kurtosis	03	30

3	Introduction to Probability	**06**	**15**
	Introduction to Probability Theory		
	Probability Theory – Terminology		
	Fundamental Concepts in Probability – Axioms of Probability		
	Application of Simple Probability Rules – Association Rule Learning		
	Bayes' Theorem		
	Random Variables		
	Probability Density Function (PDF) and Cumulative Distribution Function (CDF) of a Continuous Random Variable		
	Binomial Distribution		
	Poisson Distribution		
	Geometric Distribution		
	Parameters of Continuous Distributions		
	Uniform Distribution		
	Exponential Distribution		
	Chi-Square Distribution		
	Student's t-Distribution		
	F-Distribution		
4	Sampling and Estimation	**04**	**15**
	Introduction to Sampling		
	Population Parameters and Sample Statistic		
	Sampling		
	Probabilistic Sampling		
	Non-Probability Sampling		
	Sampling Distribution		
	Central Limit Theorem (CLT)		
	Sample Size Estimation for Mean of the Population		
	Estimation of Population Parameters		
	Method of Moments		
	Estimation of Parameters Using Method of Moments		
	Estimation of Parameters Using Maximum Likelihood Estimation		
5	simple Linear Regression	**04**	**10**
	Introduction to Simple Linear Regression		
	History of Regression–Francis Galton's Regression Model		
	Simple Linear Regression Model Building		
	Estimation of Parameters Using Ordinary Least Squares		
	Interpretation of Simple Linear Regression Coefficients		
	Validation of the Simple Linear Regression Model		
	Outlier Analysis		
	Confidence Interval for Regression Coefficients b0 and b		
	Confidence Interval for the Expected Value of Y for a Given X		
	Prediction Interval for the Value of Y for a Given X		
	Logistic Regression	**05**	**10**
	Introduction – Classification Problems		

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Introduction to Binary Logistic Regression Estimation of Parameters in Logistic Regression Interpretation of Logistic Regression Parameters Logistic Regression Model Diagnostics Classification Table, Sensitivity, and Specificity Optimal Cut-Off Probability Variable Selection in Logistic Regression Application of Logistic Regression in Credit Rating Gain Chart and Lift Chart		
Decision Trees Decision Trees: Introduction Chi-Square Automatic Interaction Detection (CHAID) Classification and Regression Tree Cost-Based Splitting Criteria Ensemble Method Random Forest	03	10

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	**40**	**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 the various areas where data science is applied.	10
CO-2	Identify the data types, relation between data and visualization technique for data.	30
CO-3	Explain probability, distribution, sampling, Estimation	30
CO-4	Solve regression and classification problem.	30

Books

1) Dinesh Kumar, Business Analytics, Wiley India

2) V.K. Jain, Data Science & Analytics, Khanna Book Publishing, New Delhi

3) Data Science For Dummies by Lillian Pierson , Jake Porway

4) Doing Data Science

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by Rachel Schutt, Cathy O'Neil, O'Reilly publication

5) Data Science with Jupyter

Author: Prateek Gupta, BPB publicationU

List of Open Source Software/learning website:
1. www.analyticsvidhya.com/
2. www.kaggle.com/

List of Practical:

Consider dataset with student name, gender, Enrollmentno, 4 semester result with marks of each subject, his mobile number, city. Implement following in Python or R.
1. Perform descriptive analysis and identify the data type.
2. Implement a method to find out variation in data. For example the difference between highest and lowest marks in each subject semester wise.
3. Plot the graph showing result of student in each semester.
4. Plot the graph showing the geographical location of students.
5. Plot the graph showing number of male and female students.
6. Implement a method to treat missing value for gender and missing value for marks.
7. Implement linear regression to predict the 5th semester result of student.
8. Implement logistic regression and decision tree to classify the student as average or clever.