



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject code: 3160002

Contributor Personality Development Program

SEMESTER VI

Type of course: Work-Personality Development

For Year: Pre-final year for all Diploma, Degree & Masters programmes over 2 semesters. For e.g. for Bachelors of Pharmacy and Engineering, the course will be conducted in Semesters V & VI.

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 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	2	70	30	30	20	150

COURSE CONTENT :

Sr. No.	Content	Total Hrs
1	Finding Solutions The market environment in which organizations are operating, is becoming increasingly dynamic and uncertain. So, employers are increasingly seeking out people who can innovate and figure out solutions in the face of any challenge (unlike in the past when it was the	1.5 hrs Classroom engagement (including self-discovery/ solutioning sessions)



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject code: 3160002

	<p>people who were most efficient and productive, who were valued by organizations). At the heart of innovation lies this way of thinking of “finding solutions” rather than “seeing problems or roadblocks”.</p> <p>Students learn how to build this way of thinking, in this topic.</p>	
2	<p>Creating Value</p> <p>Companies are also looking for employees who do not just work hard, or work efficiently or productively - but those who will make a valuable difference to the fortunes of the company. This difference may come from innovation, but it may also come from focusing on the right things and identifying what really matters – both to the company and to the customers. In this topic, students learn how to build this capability.</p>	Same as above
3	<p>Engaging deeply</p> <p>The environment we live in is becoming increasingly complex because more and more things are getting interconnected, new fields are emerging, technologies are rapidly changing, capabilities and knowledge one is trained in will become fast obsolete. In such a scenario, the student’s ability to quickly understand and master what is going on, dive deep, get involved in any area, rapidly learn new capabilities that a job demands, is important. Engaging deeply is a core way of thinking that can help them in this. In this topic, students learn how to engage deeply.</p>	Same as above
4	<p>Enlightened self-interest & collaboration at work</p> <p>The changing nature of work in organizations and in the global environment is increasingly demanding that people work more collaboratively towards shared goals and more sustainable goals. A key to working successfully when multiple stakeholders are involved is “thinking in enlightened self-interest”. In this topic, students learn how to develop this way of thinking (going beyond “narrow self-interest”).</p>	Same as above
5	<p>Human-centered thinking & Empathy</p> <p>In this topic, students explore a human-centric approach to work – where the ability to recognize and respond to other people (whether they are users or customers or team members) as a human being with human needs and difficulties, is essential. This is at the heart of user-centric design of products and solutions, at the heart of genuine customer-centricity in services, and of any successful interaction with other people.</p>	Same as above
6	<p>Trust Conduct</p> <p>The biggest currency in a sustainable career is “trust” i.e. being trusted by team members, bosses, and customers. When we are trusted, people listen to us, they are willing to give us the chance to grow, give us the space to make mistakes, and work seamlessly with each other without always having to “prove ourselves”. In this topic, students learn how to demonstrate conduct that builds the trust of people.</p>	Same as above
Showcase Lab Sessions		3 hrs
Project work		Beyond classroom



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject code: 3160002

Distribution of Theory Marks

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

Reference resources:

A. Basic reference for both students and teachers

1. Contributor Personality Program textbook cum workbook developed by Illumine
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



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject code: 3160002

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
Outcome of theory sessions		
CO-1	Students will be able to recognize & appreciate the thinking required to find solutions in the face of any challenge.	10-12%
CO-2	Students will be able to recognize & appreciate different types of value that can be created and the different ways to create value for others.	10-12%
CO-3	Students will be able to recognize & appreciate how to engage deeply, and its need, value, payoffs and consequences in different contexts.	10-12%
CO-4	Students will be able to differentiate between 'enlightened self-interest' and 'narrow self-interest' & appreciate the payoffs/ consequences of both when working with multiple stakeholders.	10-12%
CO-5	Students will be able to recognize & appreciate the human side of situations or interactions or projects that will help them develop a more human-centric approach/ response to work.	10-12%
CO-6	Students will be able to recognize & appreciate conduct which builds trust of people in contrast to conduct which breaks trust of people - in teams / organization & the value of trust conduct in various situations.	10-12%
Outcome of practical sessions		
CO-7	Students complete their 'Contributor Showcase Profile' on the Showcase Platform. This includes (a) completing Illumine's Contributor Mindset Assessment (b) building evidence to demonstrate their functional orientations as contributors.	15%
CO-8	Students learn to apply contributor thinking to think-through and address real-world challenges.	15%



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject code: 3160003

INTEGRATED PERSONALITY DEVELOPMENT COURSE

SEMESTER VI

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's 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 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	2	70	30	30	20	150

COURSE CONTENT :

Lecture No.	Content	Hours
1	Facing Failures - Insignificance of Failures	2
2	Facing Failures - Power of Faith	2
3	Facing Failures - Practicing Faith	2
4	From House to Home - Bonding the Family	2
5	Learning from Legends - Leading without Leading (Pramukh Swami Maharaj)	2
6	Review Lecture – Words of Wisdom	2
7	My India My Pride - Glorious Past - Part 1	2
8	My India My Pride - Glorious Past - Part 2	2



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject code: 3160003

9	My India My Pride - Present Scenario	2
10	Remaking Yourself - Begin with the End in Mind	2
11	My India My Pride - An Ideal Citizen - 1 (Accountability - Responsibility - Honesty - Integrity)	2
12	My India My Pride - An Ideal Citizen - 2 (Loyalty - Sincerity - Punctuality)	2
13	My India My Pride - An Ideal Citizen - 3 (Ethical & Moral Values/Practices)	2
14	Financial Wisdom - Financial Planning Process	2
15	Review Lecture - Student Voice-2	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	<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



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject code: 3160003

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, 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 Aksharpath, 2013
3	Mass Management	Project Management	<ol style="list-style-type: none"> 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
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	<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. <u>The Rise of Civilization in India and Pakistan</u>, Raymond Allchin, Bridget Allchin, <u>Cambridge University Press</u>, 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	<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



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject code: 3160003

6	Financial Wisdom	Basics of Financial Planning Financial Planning Process	<ol style="list-style-type: none">1. Rich Dad Poor Dad, Robert Kiyosaki, Plata Publishing, 20172. The Warren Buffett Way, Robert Hagstrom, Wiley, 20133. The Intelligent Investor, Benjamin Graham, Harper Business, 20064. 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	<ol style="list-style-type: none">1. “What Makes a Good Life? Lessons from the Longest Study on Happiness”, R. Waldinger, Ted Talks, 20152. Long Walk To Freedom, Nelson Mandela, Back Bay Books, 19953. Outliers, Malcolm Gladwell, Back Bay Books, 2011
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: 3161608

ARTIFICIAL INTELLIGENCE

6th SEMESTER

Type of course: Regular

Prerequisite: Data Structures and Algorithms, Mathematical foundations for Computer Science

Rationale: With the usage of Internet and World Wide Web increasing day by day, the field of AI and its techniques are being used in many areas which directly affect human life. Various techniques for encoding knowledge in computer systems such as Predicate Logic, Production rules, Semantic networks find application in real world problems. The fields of AI such as Game Playing, Natural Language Processing, and Connectionist Models are also important.

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)		
				PA	ALA	ESE	OEP			
3	0	2	4	70	20	10	20	10	20	150

Content

Sr. No.	Course Contents	Teaching hours	Weightage
1	What is AI? : The AI Problems, The Underlying Assumption, What is an AI Techniques, The Level Of The Model, Criteria For Success, Some General References, One Final Word.	2	5
2	Problems, State Space Search & Heuristic Search Techniques : Defining The Problems As A State Space Search, Production Systems, Production Characteristics, Production System Characteristics, And Issues In The Design Of Search Programs, Additional Problems. Generate-And-Test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis, A* and AO* search.	8	15
3	Logical Agents: Knowledge-based agents, The Wumpus world, Logic, Propositional logic, Propositional theorem proving, Effective propositional model checking, Agents based on propositional logic. First Order Logic: Representation Revisited, Syntax and Semantics of First Order logic, Using First Order logic.	4	10
4	Inference in First Order Logic: Propositional Versus First Order Inference, Unification, Forward Chaining, Backward Chaining, Resolution	4	10
5	Uncertainty – Acting under Uncertainty, Basic Probability Notation, The Axioms of Probability, Inference Using Full Joint Distributions,	4	10
6	Probabilistic Reasoning – Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distribution, Exact Inference in Bayesian Networks, Approximate Inference in Bayesian Networks	3	10



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3161608

7	Game Playing: Overview, and Example Domain : Overview, MiniMax, Alpha-Beta Cut-off, Refinements, Iterative deepening, The Blocks World, Components of a Planning System, Goal Stack Planning, Nonlinear Planning Using Constraint Posting, Hierarchical Planning, Reactive Systems, Other Planning Techniques.	5	15
8	Statistical Learning Methods – Statistical Learning, Learning with Complete Data, Learning with Hidden Variables: EM Algorithm.	4	10
9	Introduction to Prolog : Introduction To Prolog: Syntax and Numeric Function, Basic List Manipulation Functions In Prolog,	8	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	15	25	25	20	5

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

Reference Books:

1. "Artificial Intelligence" -By Elaine Rich And Kevin Knight (2nd Edition) Tata Mcgraw-Hill
2. Artificial Intelligence: A Modern Approach, Stuart Russel, Peter Norvig, PHI
3. Nils J Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kaufmann Publications, 2000.
4. Introduction to Prolog Programming By Carl Townsend.
5. "PROLOG Programming For Artificial Intelligence" -By Ivan Bratko(Addison-Wesley)
6. "Programming with PROLOG" –By Klocksinn and Mellish.

Sr. No.	CO statement	Marks % weightage
CO-1	Ability to understand problem solving methods and their applications	20%
CO-2	Ability to analyze Searching, knowledge representation and Inferencing Techniques	30%
CO-3	Ability to apply problem solving, knowledge representation and reasoning techniques for various applications.	30%
CO-4	Ability to demonstrate practical applications of AI Techniques.	20%

List of Experiments:

1. Write a program to implement Tic-Tac-Toe game problem.
2. Write a program to implement BFS (for 8 puzzle problem or Water Jug problem or any AI search problem).
3. Write a program to implement DFS (for 8 puzzle problem or Water Jug problem or any AI search problem)
4. Write a program to implement Single Player Game (Using Heuristic Function)
5. Write a program to Implement A* Algorithm.
6. Write a program to solve N-Queens problem using Prolog.
7. Write a program to solve 8 puzzle problem using Prolog.
8. Write a program to solve travelling salesman problem using Prolog.
9. Develop an expert system for medical diagnosis of childhood diseases using prolog.
10. Write a Prolog program to count even and odd elements from list and count elements up to specific index in list.



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3161608

Open Ended Problems:

1. Describe major subfields and paradigms of AI.
2. What are the major challenges in the field of AI?
3. How AI can be used to develop a better search Engine?

Major Equipments: Computer/Prolog Language

List of Open Source Software/learning website:

1. <http://www.journals.elsevier.com/artificial-intelligence/>
2. <https://www.technologyreview.com/s/534871/our-fear-of-artificial-intelligence/>
3. <http://www.sanfoundry.com/artificial-intelligence-mcqs-inductive-logic-unification-lifting-1/>

GTUQuestionPapers.com



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3163203

ENGINEERING ELECTROMAGNETICS AND WAVE PROPAGATION 6th SEMESTER

Type of course: Undergraduate (Elective)

Prerequisite: Knowledge of vector calculus, Electric and Magnetic fields and its laws.

Rationale: This course provides strong foundation for understanding the fundamental principles and laws of electromagnetism to understand transmission, radiation and propagation theory. Students can understand the physical interpretation and application of various laws and theorems of electric and magnetic fields. The students can also understand the transmission lines, antennas and waveguides theory.

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)		
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs.	% Weightage
1	Vector Analysis: Scalars and Vectors, Vector Algebra, The Rectangular Coordinate System, Vector Components and Unit Vectors, The Vector Field, The Dot Product, The Cross Product, Other Coordinate Systems: Circular, Cylindrical Coordinates & The Spherical Coordinate System.	04	10
2	Coulomb's Law and Electric Field Intensity: The Experimental Law of Coulomb, Electric Field Intensity, Field Arising from a Continuous Volume Charge Distribution, Field of a Line Charge, Field of a Sheet of Charge.	04	10
3	Electric Flux Density, Gauss's Law and Divergence: Electric Flux Density, Gauss's Law and Application of Gauss's Law: Some Symmetrical Charge Distributions and Differential Volume Element, Divergence and Maxwell's First Equation, The Vector Operator ∇ and the Divergence Theorem.	05	15
4	Energy and Potential: Energy Expended in Moving a Point Charge in an Electric Field, The Line Integral, Definition of Potential Difference and Potential, The Potential Field of a Point Charge, Potential Gradient, The Electric Dipole.	04	10
5	Conductors and Dielectrics: Current and Current Density, Continuity of Current, Metallic Conductors, Conductor Properties and Boundary Conditions, The Nature of Dielectric Materials, Boundary Conditions for Perfect Dielectric Material.	04	05
6	Capacitance: Capacitance, Parallel-Plate Capacitor, Several Capacitance Examples, Poisson's and Laplace's Equations.	03	05



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3163203

7	The Steady Magnetic Field: Biot-Savart Law, Ampere's Circuital Law, Curl, Stokes' Theorem, Magnetic Flux and Magnetic Flux Density.	04	10
8	Magnetic Forces, Materials and Inductance: Force on a Moving Charge, Force on a Differential Current Element, Hall Effect, Force between Differential Current Elements, Force and Torque on a Closed Circuit, The Nature of Magnetic Materials, Magnetization and Permeability, Magnetic Boundary Conditions.	05	10
9	Time-Varying Fields and Maxwell's Equations: Faraday's Law, Displacement Current, Maxwell's Equations in Point Form, Maxwell's Equations in Integral Form.	04	10
10	Electromagnetic Wave Propagation: Wave Propagation in Free Space, Lossy and Lossless Dielectrics and in Good Conductors. Reflection of Plane Wave, Poynting Vector, Wave Power, Skin Effect, Wave Polarization and Standing Wave Ratio.	05	15

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
05	20	10	20	10	05

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. Engineering Electromagnetics, William H Hayt And John A Buck - Tata McGraw-Hill Publishing Company Limited, Seventh Edition
2. Principles of Electromagnetics, Matthew N. O. Sadiku - Oxford university press, 2007 - fourth edition
3. Electromagnetics with applications by J.D.Krauss and Daniel Fleisch fifth edition, Mcgraw Hill.
4. Fundamentals of Electromagnetics with MATLAB, Karl Erik Lonngren, Sava Vasilev Savov, Scitech Publishing Inc.

Course Outcome:

After learning the course, the students should be able to:

Sr. No.	CO Statement	Marks % Weightage
CO-1	Explain the physical interpretation of coulomb's law, Gauss's law, Biot Savart law and Ampere's Circuital law.	10
CO-2	Explain the physical interpretation and application of divergence, curl and gradient.	15
CO-3	Analyze the electromagnetic waves using divergence theorem and stock theorem.	20



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3163203

CO-4	Design, analyze and test the capacitor, co-axial cable, waveguide and antennas.	20
CO-5	Analyze the electromagnetic waves using Maxwell's equations, Poisson's and Laplace equations.	15
CO-6	Determine skin effect, Hall Effect, pointing vector, and standing wave ratio of electromagnetic waves.	10
CO-7	Describe and analyze electromagnetic wave propagation in free-space, dielectrics and conductors.	10

List of Experiments: Assignments from different chapters are to be given to the students. Numerical to be solved during session.

Design based Problems (DP)/Open Ended Problem:

1. Design the MATLAB programs for vector calculus.
2. Design MATLAB programs to calculate electric field intensity due to line, surface and volume charge density.
3. Design MATLAB programs for gradient operation.
4. Design MATLAB programs for divergence operation.
5. Design MATLAB programs for curl operations.

List of Open Source Software/learning website:

1. CD available with first reference book.
2. nptel.ac.in
3. Scilab
4. <http://www.Scitechpub.com/>
5. Wikipedia.org



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3163206

ANALOG AND DIGITAL COMMUNICATION

6th SEMESTER

Type of course: Undergraduate

Prerequisite: Communication Fundamentals

Rationale: Analog and digital communication includes techniques of analog and digital modulation and demodulation as well as the transmitter and receiver designs for the communication systems.

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)	
4	0	2	5	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs.	% Weightage
1	Introduction to communication systems: Elements of Communication System, Need for modulation, Technologies in Communication Systems, Signal representation and analysis.	03	06
2	Noise: External noise, Internal noise, Noise calculations, Noise figure, Noise temperature.	04	10
3	Amplitude modulation techniques: Elements of Analog Communication, Amplitude Modulation index, Modulation index for sinusoidal AM equation, Amplitude modulation techniques, Double sideband suppressed carrier modulation, Single sideband suppressed carrier modulation, Generation of AM signals: Amplitude Modulators, Amplitude demodulator circuits, Amplitude-modulated Transmitters.	08	15
4	Angle modulation techniques: Introduction, Frequency Modulation, Sinusoidal FM, Frequency Spectrum for Sinusoidal FM, Non-sinusoidal modulation-Deviation ratio, Measurement of modulation index for sinusoidal FM, Phase modulation, Equivalence between PM and FM, sinusoidal phase modulation, Angle modulator circuits, angle modulation detectors, Automatic Frequency Control, Practical Issues in FM, pre-emphasis and de-emphasis system.	08	15
5	Radio Transmitters and Receivers: Introduction to Radio Communication, Radio Transmitters, Receiver types, AM receivers, FM receivers, SSB Receivers.	08	20
6	Pulse Modulation techniques: PAM, PWM, PPM, PCM, Quantization, Differential PCM, Delta modulation, Adaptive delta modulation, Adaptive differential PCM.	08	10
7	Digital Modulation Techniques: Introduction, Basic digital modulation techniques:	06	08



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3163206

	ASK, FSK, PSK		
8	Digital Demodulation Techniques: Basic digital demodulation techniques: ASK, FSK, PSK	06	08
9	Spread Spectrum Communications: Introduction to Frequency hopping, Introduction to direct sequence Spread Spectrum, Introduction to CDMA, Overview of latest trends in digital communication.	05	08

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
12	20	24	6	4	4

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. Electronic Communications, Dennis Roddy, John Coolen.
2. Electronic Communication Systems, George Kennedy, Bernard Davis, S R M Prasanna.
3. Modern Digital and Analog Communication Systems, by B. P. Lathi and Zhi Ding.
4. Communication Systems by by Simon Haykin, 4th edition, John Wiley & Sons Publication.

Course Outcome: After learning the course the students should be able to:

Sr. No.	CO Statement	Marks % Weightage
CO-1	Understand the importance of communication systems and effect of various noises associated with them.	15
CO-2	Implement the analog modulation techniques on various information signals.	25
CO-3	Use the transmitters and receivers for different communication systems.	25
CO-4	Identify different pulse modulation techniques.	10
CO-5	Perform digital modulation techniques for digital communication systems.	25

List of Experiments:

1. To study the block diagram of AM broadcast transmitter.



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3163206

2. To study the circuit of AM modulation & calculation of modulation index.
3. To study frequency modulation & calculation of modulation index.
4. To study block diagram of AM receiver.
5. To study Characteristics for pre-emphasis & de-emphasis circuits.
6. To generate amplitude modulation (AM) waveform and to measure modulation index of AM wave using waveform method and trapezoidal method.
7. To study and perform PAM, PWM, PPM.
8. To understand the concept of Pulse Code Modulation and to observe the performance of PCM system.
9. To Study and observe the performance of Digital carrier system—ASK.
10. To Study and observe the performance of Digital carrier system—FSK.
11. To Study and observe the performance of Digital carrier system—PSK

Design based Problems (DP)/Open Ended Problem:

1. Error detection and correction in MATLAB.
2. Designing a schematic of modulator and demodulator in simulation software.

Major Equipment:

1. AM / FM modulator – demodulator kit
2. PCM kit
3. ASK / PSK modulator – demodulator kit
4. MATLAB

List of Open Source Software/learning website:

1. www.nptel.ac.in



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3163207

MICROPROCESSOR AND MICROCONTROLLER

6th SEMESTER

Type of course: Undergraduate

Prerequisite: Students should have logical ability and programming skills to develop the code.

Rationale: The knowledge of microprocessor & microcontroller is very essential for a student of BE in Information & Communication engineering as the world is migrating towards automation rapidly in every fields.

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)		
4	0	2	5	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs.	% Weightage
1	Introduction of Microprocessor of 8085: Introduction of Microprocessors, Microcomputer System, Difference between Microcontrollers & Microprocessors.	4	6
2	Architecture of Microprocessor of 8085 & 8051 Microcontroller: 8085 Microprocessor Architecture, Address, Data and Control Buses, Pin Functions, De-multiplexing of Buses, Generation Of Control Signals, Memory Interfacing, Architecture of 8051, Pin Function of 8051 microcontroller.	9	22
3	Introduction To 8-bit AVR Microcontroller: Overview of AVR family, AVR Microcontroller architecture, Register, AVR status register, ROM space and other hardware modules, ATmega32 pin configuration & function of each pin.	9	20
4	AVR Assembly Language Programming: Addressing modes of AVR, Data transfer, Arithmetic, Logic and Compare, Rotate and Shift, Branch and Call instructions. AVR data types and assembler directives, AVR assembly language programs, AVR I/O Port Programming, Time delay loop.	13	20
5	AVR Programming in C: Data types, I/O programming, logic operations, Timer programming in assembly and C, Interrupt programming in assembly and C, Serial Port programming in assembly and C.	10	20
6	Peripheral Interfacing: 7-Segment LED Display, LCD and Keyboard Interfacing, ADC, DAC and sensor interfacing, Relay, Opto-isolator and Stepper Motor Interfacing, DC motor control, I2C Protocol and RTC interfacing.	11	12



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3163207

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
12	22	24	8	4	-

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. The AVR Microcontroller and Embedded Systems Using Assembly and C, by Muhammad Ali Mazidi, Sarmad Naimi and Sepehr Naimi, Pearson Education Electronic Communication Systems, George Kennedy, Bernard Davis, S R M Prasanna.
2. Microprocessor Architecture Programming and Applications by R. S. Gaonkar – Fourth Edition (WEL).
3. Mohammad Ali Mazidi, Janice Gillispie Mazidi and Rolin McKinlay, The 8051 Microcontroller and Embedded Systems using Assembly and C, 2/e Second Edition, Pearson Education.
4. Programming and Customizing the AVR Microcontroller, by Dhananjay Gadre, McGraw Hill Education.

Course Outcome: After learning the course the students should be able to:

Sr. No.	CO Statement	Marks % Weightage
CO-1	Understand the architectures of Microprocessor and Microcontroller.	25
CO-2	Apply the basic concepts of digital fundamentals to Microprocessor and Microcontroller based systems.	15
CO-3	Analyze the properties of Microprocessor and Microcontroller.	15
CO-4	Perform programming to solve real world problems.	30
CO-5	Illustrate how the different peripherals are interfaced with Microcontroller.	15

List of Experiments:

1. To study the PIN Diagram & block diagram of 8085 Microprocessor & 8051 Microcontroller.
2. To study the AVR Studio and Arduino Software.
3. Write and simulate minimum of 5 programs (Assembly) to be written making effective use of all the instructions and on-chip peripheral.
4. Write program for blinking LED.
5. Read Push-button switch and display its status on LED.
6. Interfacing Buzzer with AVR Board.
7. Interfacing 7-Segment LED Display with AVR Board.



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3163207

8. Interfacing of 16x2 LCD with Arduino board and display message on it.
9. Interface 4x4 matrix keyboard with AVR microcontroller. Display value of pressed switch on LCD.
10. Interface temperature sensor LM35 with Arduino board and display temperature on LCD.
11. Write a Program for the Relay, Stepper Motor Interfacing.
12. Write a Program for DC motor control in clockwise and anticlockwise direction.

Design based Problems (DP)/Open Ended Problem:

1. Connect infrared sensor with AVR microcontroller. Control electrical device with help of IR remote control.
2. Read 100 temperature readings using LM35 and Arduino board, take average of it and send it to PC using serial communication.
3. Interface LDR with Arduino board. Display light intensity on LCD. If light intensity is less than certain threshold value, switch ON lamp connected with Arduino board with help of driver circuit.

Major Equipment:

1. AVR ATmega32 microcontroller trainer kit with peripheral devices.
2. Arduino Software, Proteus Software for Simulation, Arduino Board.
3. Computer system.

List of Open Source Software/learning website:

1. Open source AVR simulator.
2. www.atmel.com
3. www.arduino.cc

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 website 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: 3163208

OPTICAL COMMUNICATION

B.E. 6th SEMESTER

Type of course: Undergraduate (Elective)

Prerequisite: Semiconductor Physics, Electromagnetics

Rationale: To introduce the students to various optical fiber modes, configurations and various signal degradation factors associated with optical fiber and to study about various optical sources and optical detectors and their use in the optical communication system, optical amplifiers, fiber network elements, basic optical components, and techniques of fiber optic measurement.

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	Total Hrs.	% Weightage
1	Overview of Optical fiber Communications: Basic network information rates, Evolution of fiber optic systems, Elements of an optical fiber transmission link, Advantages and disadvantages of optical fiber system.	3	6
2	Introduction to optical fibers: Fundamentals of Light Propagation in Optical Fiber, Numerical aperture, Multimode Fibers, Single Mode Fibers, Step Index and Graded Index (GI) fibers, Attenuation and Dispersion.	7	20
3	Optical Sources: Light emitting diode (LEDs) - Structures, Materials, Characteristics & Modulation, Laser Diodes -Modes & threshold condition, Structures, Single mode lasers.	6	12
4	Photo detectors: Principles of operation, types, characteristics, figure of merits of detectors photodiode materials, photo detector noise.	4	10
5	Optical Receiver Operation: Receiver operation, Preamplifier types, receiver performance and sensitivity, Eye diagrams, Coherent detection, Specification of receivers.	5	10
6	Transmission Systems: Point –to–point link –system considerations, Link power budget and rise time budget methods for design of optical link, BER calculation.	3	10
7	Optical Amplifiers: Semiconductor optical Amplifier, EDFA, Raman Amplifier, Wideband Optical Amplifiers.	3	8
	Overview of Optical Components:		



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3163208

8	Optical couplers, Tunable sources and Filters, optical MUX/DEMUX, Arrayed waveguide grating, optical add drop multiplexer (OADM), optical circulators, attenuators, optical cross connects, wavelength converter, Mach-Zender Interferometer.	3	10
9	Advances in Optical Fiber Systems: Principles of WDM, DWDM, Telecommunications & broadband application, SONET/SDH, MUX, Analog & Digital broadband, optical switching.	5	8
10	Fiber Optical Measurements: Test equipment, OTDR, Set ups for Measurement of Attenuation, Dispersion, NA and EYE pattern.	3	6

Suggested Specification table with Marks (Theory):

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

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. Optical Fiber Communications by Gerd Keiser, 4th Edition (Mc Graw Hill).
2. Optical Fiber Communication by John M. Senior (PHI/Pearson).
3. Fiber optical communication Technology by Djafar Mymbaev & Lowell L, Scheiner. (Pearson).
4. Fiber optic Communication Systems by G. Agrawal (John Wiley and sons).

Course Outcome: After learning the course the students will be able

Sr. No.	CO Statement	Marks % Weightage
CO-1	Understand and classify the structures of optical fibers.	25
CO-2	Analyze the different optical sources and detectors.	20
CO-3	Performance evaluation of optical receiver.	10
CO-4	Design and analyze optical transmission systems.	15
CO-5	Identify the various components for optical communication.	25
CO-6	Use the various optical measurement techniques.	5



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3163208

List of Experiments:

1. Setting-up of Analog/ Digital Optical communication Link.
2. Measurement of attenuation characteristics of an optical fiber.
3. Measurement of NA of a multimode fiber.
4. Measurement of Mode field diameter of a single mode fiber.
5. Measurement of Dispersion of optical fiber.
6. Performance of PAM on fiber optic link.
7. Performance of PWM on fiber optic link.
8. Performance of PPM on fiber optic link.
9. Measurement of attenuation with OTDR.
10. Measurement of emission wavelength of LED/LASER source.
11. Measurement of Data quality with EYE PATTERN.
12. Preparation of optical fiber end and practices on splicing/connectorization.
13. Performance of TDM on fiber optic link.
14. Setting -up of voice link on Optical communication Link.
15. Performing Experiments on the VI characteristics of the optical Sources.
16. Performing Experiments on the characteristics of the optical detectors.

Design based Problems (DP)/Open Ended Problem:

Open ended Problem:

1. Calculation of G. I. fiber parameters like Normalized frequency, No. of Guided Modes based on given data.
2. Determining the S.I. fiber parameters based on given data.
3. Calculation and determination of fiber optical sources parameters like LED, LASER based on given data.
4. Analysis of power link budget and various parameters.
5. Determination and calculations of various photo detectors (PIN, APD) parameters based on given data.
6. Analysis and calculations of various parameters of fiber optic passive network components.

Major Equipments: Fiber Optical Trainer Kit, Laser Source, Photo Detector, Optical Power Meter, OTDR, WDM trainer setup, splicing and connectorization kits.

List of Open Source Software/learning website:

1. <http://www.cdeep.iitb.ac.in/nptel/Electrical%20&%20Comm%20Engg/Optical%20Communication/Course%20Objective.htm>



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3163209

DATA MINING & BUSINESS INTELLIGENCE

6th SEMESTER

Type of course: Undergraduate (Elective)

Prerequisite: NA

Rationale: NA

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	Total Hrs.	% Weightage
1	Overview and concepts Data Warehousing (DW) and Business Intelligence (BI): Why reporting and Analysing data, Raw data to valuable information- Lifecycle of Data - What is Business Intelligence - BI and DW in today's perspective - What is data warehousing - The building Blocks: Defining Features - Data warehouses and data marts - Overview of the components - Metadata in the data warehouse - Need for data warehousing - Basic elements of data warehousing - trends in data warehousing, Relation between BI and DW - OLAP (Online analytical processing) definitions - Difference between OLAP and OLTP - Dimensional analysis	6	15
2	Introduction to data mining (DM): Motivation for Data Mining - Data Mining-Definition and Functionalities – Classification of DM Systems - DM task primitives - Integration of a Data Mining system with a Database or a Data Warehouse - Issues in DM – KDD Process	3	08
3	Data Pre-processing: Why to pre-process data? - Data cleaning: Missing Values, Noisy Data - Data Integration and transformation - Data Reduction: Data cube aggregation, Dimensionality reduction - Data Compression - Numerosity Reduction - Data Mining Primitives - Languages and System Architectures: Task relevant data - Kind of Knowledge to be mined - Discretization and Concept Hierarchy.	6	15
4	Concept Description and Association Rule Mining: What is concept description? - Data Generalization and summarization-based characterization - Attribute relevance - class comparisons Association Rule Mining: Market basket analysis - basic concepts - Finding frequent item sets: Apriori algorithm - generating rules – Improved Apriori algorithm – Incremental ARM – Associative Classification – Rule Mining	8	20



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3163209

5	Classification and Prediction: What is classification and prediction? – Issues regarding Classification and prediction: Classification methods: Decision tree, Bayesian Classification, Rule based, CART, Neural Network Prediction methods: Linear and nonlinear regression, Logistic Regression Introduction of tools such as DB Miner / WEKA / DTREG DM Tools	8	20
6	Data Mining for Business Intelligence Applications: Data mining for business Applications like Fraud Detection, Clickstream, Market Segmentation, Retailing, Telecommunications, Banking & Finance and CRM etc	3	07
7	Advance topics: Introduction and basic concepts of - Clustering, Spatial mining, Spatial mining, Temporal Mining, Web mining, Text mining. Big Data: Introduction to big data: distributed file system – Big Data and its importance, Four Vs, Drivers for Big data, Big data analytics, Big data applications. Algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce. Introduction to Hadoop architecture: Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands , Anatomy of File Write and Read., NameNode, Secondary NameNode, and DataNode, Hadoop MapReduce paradigm, Map and Reduce tasks, Job, Task trackers - Cluster Setup – SSH & Hadoop Configuration – HDFS Administering – Monitoring & Maintenance.	8	15

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	20	15	15	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. J. Han, M. Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann
2. M. Kantardzic, "Data mining: Concepts, models, methods and algorithms, John Wiley & Sons Inc.
3. Paulraj Ponnian, "Data Warehousing Fundamentals", John Willey.
4. M. Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education.
5. G. Shmueli, N.R. Patel, P.C. Bruce, "Data Mining for Business Intelligence: Concepts, Techniques, and Applications in Microsoft Office Excel with XLMiner", Wiley India
6. Ning Tan, Vipin Kumar, Michael Steinbach Pang, "Introduction to Data Mining", Pearson Education



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3163209

Course Outcome: After learning the course the students will be able

Sr. No.	CO Statement	Marks % Weightage
CO-1	Understand why the data warehousing is important in addition to database systems.	10
CO-2	Perform the preprocessing of data and apply mining techniques on it.	20
CO-3	Identify the association rules, classification, and clusters in large data sets.	25
CO-4	Solve real world problems in business and scientific information using data mining.	15
CO-5	Use data analysis tools for scientific applications.	15
CO-6	Implement various supervised machine learning algorithms.	15

List of Experiments:

Laboratory work will be based on the above syllabus with minimum 10 experiments to be incorporated.



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3163210

DISTRIBUTED COMPUTING

6th SEMESTER

Type of course: Undergraduate (Elective)

Prerequisite: Operating Systems, Data Communication and Networking

Rationale: Student has studied subject Operating Systems. The work of Operating System is different in the distributed environment. Student should understand Message passing, RPC, Synchronization, Load Balancing. Migration of processes, Deadlock management etc in distributed environment.

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

Contents

Sr. No	Contents	Teaching Hours	% Weightage
1	Concepts of Distributed Systems: Introduction, Distributed computing models, Software concepts, Design issues in distributed systems, Client-server model, Basics of Network communication, Network Models.	5	10
2	Inter-process Communication: Message Passing and its features, IPC message format, IPC synchronization, Buffering, multi datagram messaging, process addressing techniques, failure handling, Formal Models for message passing systems, Broadcast and converge cast on a spanning tree, Flooding and building a spanning tree, Constructing a DFS spanning tree with and without a specified root	8	20
3	Remote Communication: Introduction, RPC basics, RPC implementation, RPC Communication and Other issues, Sun RPC, RMI basics, RMI Implementation, Java RMI	6	15
4	Synchronization: Clock synchronization, Logical clocks, Global state, Mutual exclusion, Election algorithms: Bully algorithm, Ring algorithm, Leader election in rings, anonymous rings, Asynchronous rings, synchronous rings, election in wireless networks, Deadlocks in Distributed systems, Deadlocks in Message communication	8	15
5	Distributed System Management: Resource management, Task management approach, Load balancing approach, Load sharing approach, Process Management, Process migration, threads, fault tolerance	6	10
6	Distributed Shared Memory: Concepts, Hardware DSM, Design issues in DSM systems, Implementation issues, Heterogeneous and other DSM systems	4	10
7	Naming: Overview, Features, Basic concepts, System oriented names, Object locating mechanisms, Directory service	3	10
8	Google File system and Hadoop distributed file system	2	10



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3163210

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	30	10	10	0	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.

Text Books:

1. Distributed Systems: Principles and Paradigms, Taunenbaum
2. Distributed Systems: Concepts and Design, G. Coulouris, J. Dollimore, and T. Kindberg, Pearson Education
3. Distributed Computing, Sunita Mahajan and Seema Shah, Oxford University Press
4. Distributed Computing, Fundamentals, Simulations and Advanced topics, 2nd Edition, Hagit Attiya and Jennifer Welch, Wiley India
5. Distributed Operating System, Pradeep K Sinha, PHI

Course Outcome:

After learning the course the students should be able to

Sr. No.	CO Statement	Marks % Weightage
CO-1	Understand the concepts and fundamentals of distributed systems.	15
CO-2	Understand and implement the inter-process communication using RPC concepts.	25
CO-3	Understand and implement synchronization in client-server approach.	25
CO-4	Understand and implement the thread concepts.	20
CO-5	Understand the concept of distributed file system.	15

List of Experiments

1. Implement concurrent client-server application using socket programming in UNIX/LINUX.
2. Study of rpcgen protocol compiler.
3. Write a program to create a calculator using rpcgen utility.
4. Write a program to create a calculator using JAVA RMI.
5. Inter-process communication using shared memory in UNIX/LINUX
6. Inter-thread communication using POSIX thread library or JAVA.
7. Client-server programming using pthread library and socket programming.
8. Implement inter-thread synchronization using Mutual exclusion.
9. Implement Inter-thread communication using Semaphores.
10. Implement Lamport's logical clock
11. Implement leader election algorithm



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3163211

Semester – VI

Subject Name: Digital Signal Processing

Type of course: Professional Core Course

Prerequisite: Signal and System and Mathematics

Rationale: The primary objective of this course is to provide a thorough understanding and working knowledge of design, implementation and analysis DSP systems.

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	Total Hrs
1	Discrete-Time Signals and Systems: Discrete-Time Signals, Discrete-Time Systems, LTI Systems, linear convolution and its properties, Linear Constant Co- efficient Difference equations, Frequency domain representation of Discrete-Time Signals & Systems, Representation of sequences by discrete time Fourier Transform, (DTFT), correlation of signals	8
2	The Z- Transform and Analysis Linear Time-of Invariant System: Z-Transform, Properties of ROC for Z-transform, the inverse Z-transform methods, Z-transforms properties, Analysis of LTI systems in time domain and stability considerations. Frequency response of LTI system, System functions for systems with linear constant-coefficient Difference equations, Freq. response of rational system functions relationship between magnitude & phase, All pass systems, inverse systems, Minimum/Maximum phase systems, systems with linear phase.	10
3	Structures for Discrete Time Systems: Block Diagram and signal flow diagram representations of Linear Constant- Coefficient Difference equations, Basic Structures of IIR Systems, Transposed forms, Direct and cascade form Structures for FIR Systems, Effects of Co-efficient quantization.	8
4	Filter Design Techniques: Design of Discrete-Time IIR filters from Continuous-Time filters Approximation by derivatives, Impulse invariance and Bilinear Transformation methods; Design of FIR filters by windowing techniques, Illustrative design examples of IIR and filters.	8



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3163211

5	Discrete-Fourier Transform: Representation of Periodic sequences: The discrete Fourier Series and its Properties Fourier Transform of Periodic Signals, Sampling the Fourier Transform, The Discrete-Fourier Transform, Properties of DFT, Linear Convolution using DFT.	8
6	Fast Fourier Transform: FFT-Efficient Computation of DFT, Goertzel Algorithm, radix2 and radix Decimation-in-Time and Decimation-in-Frequency FFT Algorithms.	8

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
5	15	15	15	10	10

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. "Digital Signal Processing: Principles, Algorithm & Application", 4th edition, Proakis, Manolakis, Pearson
2. "Discrete Time Signal Processing":Oppenheim, Schafer, BuckPearson education publication, 2nd Edition, 2003.
3. Digital Signal Processing fundamentals and Applications,Li Tan , Jean Jiang, Academic Press,2nd edition,2013
4. Digital Signal Processing – A computer based Approach, S.K.Mitra, Tata McGraw Hill,3rd edition,2006
5. Fundamentals of digital Signal Processing –Lonnie c.Ludeman, Wiley
6. Digital Signal processing-A Practical Approach,second edition, Emmanuel I. feacher, and BarrieW..Jervis, Pearson Education
7. Digital Signal Processing, S.Salivahanan, A.Vallavaraj, C.Gnapriya TMH
8. Digital Signal Processors, Architecture, programming and applications by B. Venkatramani, M Bhaskar, Mc-Graw Hill

Course Outcomes:

By the end of this course, the student will be able to:



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3163211

Sr. No.	CO statement	Marks % weightage
CO-1	Formulate engineering problems in terms of DSP tasks	20
CO-2	Analyse digital and analog signals and systems	20
CO-3	Analyse discrete time signals in frequency domain	10
CO-4	Design digital filters	20
CO-5	Change sampling rate of the signal	10
CO-6	Apply digital signal processing algorithms to various areas	20

List of Experiments:

Sr.No.	Experiment Name
1	Write a MATLAB program to illustrate: i) The effect of up-sampling in frequency domain. ii) The effect of Interpolation process.
2	Write a MATLAB program to find the linear convolution of two sequences. i) Without using MATLAB convolution function. ii) Using MATLAB function.
3	Write a MATLAB program to obtain i) Partial fraction expansion of rational Z-transform. ii) Z-transform from partial fraction expansion. iii) Power series expansion of Z-transform. iv) Stability test for Z-transform
4	Write a MATLAB program to obtain: i) N-point DFT of sequence. ii) N-point IDFT of sequence. iii) Linear convolution by DFT
5	Write a MATLAB program to design following Butterworth filters. i) Low Pass Filter iii) Band Pass Filter ii) High Pass Filter iv) Band Reject Filter.
6	Write a MATLAB program to design following Chebyshev-I filters. i) Low Pass Filter iii) Band Pass Filter. ii) High Pass Filter. iv) Band Reject Filter



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3163211

7	Write a MATLAB program to design following Chebyshev-I filters. i) Low Pass Filter iii) Band Pass Filter. ii) High Pass Filter iv) Band Reject Filter
8	Write a MATLAB program to design FIR filter using following window. i) Rectangular window. iv) Blackman window. ii) Kaiser window. v) Hanning window. iii) Bartlett window. vi) Hamming window.
9	Write a program to perform circular convolution of two sequences using DFT.
10	Write a program to demonstrate the time shifting and frequency shifting property of DTFT.

List of Software: MATLAB/Code Composer Studio

List of Open Source Software/learning website: MATLAB/Code Composer Studio,
www.nptel.edu, <http://ocw.mit.edu>, <https://cnx.org/content>



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3163212

IT INFRASTRUCTURE AND UTILITIES

6th SEMESTER

Type of course: Undergraduate (Elective)

Prerequisite: NA

Rationale: Obtaining efficient IT Infrastructure is very important in modern scenario as the world want all the resources shared and analyzed online. This course enables to understand and analyze the IT infrastructure technology and equipment's required for Smart Infrastructure.

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	Course content	Total Hrs	%Weightage
1	Introduction and Technology for Smart Infrastructure: System Software and Service Architecture Terminology: RTOS concepts and definitions, real-time design issues. Smart grids. Introduction to sensors, Types of Sensors, Moisture sensor, tilt sensor, smoke sensor, Temperature Sensor, Pressure Sensor, Level Sensor Fibre Optic Sensors, Acoustic Sensors etc.	06	20%
2	Introduction to IOT Overview of IOT concepts, IOT Standards, Components of IOT System, Relevance of IOT for the future, IOT Applications, The role of Artificial Intelligence in Internet of Things with applications, Challenges in IOT implementation: Device Level Energy Issues, Recommendations on Research Topics.	10	25%
3	AR-VR Technology Basics of Augmented Reality and Virtual Reality, History and differences between Augmented and Virtual Reality. Input devices – controllers, motion trackers and motion capture technologies for tracking, navigation and gestural control. Output devices – Head Mounted VR Displays, Augmented and Mixed reality glasses AR applications in navigation, Search Engine, etc. Application of VR in Digital Entertainment.	10	25%



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3163212

4	Data Center Infrastructure Data Center Architecture, Data Center Design Models: Three-Tier and Multi-Tier Models. IT Equipment, Power backup, Maintenance, Recovery, Security, Performance analysis of architectures. Case Study: The Cisco Virtualized Multi-tenant Data Center CVD	8	20%
5	Computer Applications in infrastructure development (Case Studies) Smart Energy Meter, Wearable Devices, Smart Traffic System, Smart Home Automation, Smart Security Surveillance, Smart Sanitation Smart Public Safety, Smart water management, IOT in Indian Scenario: Aadhaar	8	10%

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. Dr Mani N, Smart Cities & Urban Development in India, New Century Publications, 2016
2. Mehmood, R., See, C.W.S., Katib, I., Chlamtac, I., Smart Infrastructure and Applications, EAI/Springer Innovations in Communication and Computing, 2020
3. Cuno Pfister , Getting Started with the Internet of Things: Connecting Sensors and Microcontrollers to the Cloud, Maker Media, Inc., 17-May-2011
4. Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition. Wiley-IEEE Press, 2003/2006.
5. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.

Course Outcome:

After learning the course the students should be able to:

Sr. No.	CO Statement	Marks % Weightage
CO-1	Know the details of equipment's required for creating smart infrastructures	30
CO-2	Understand the IOT architecture	25
CO-3	Understand the importance and applications of Augmented and Virtual Reality Systems	25
CO-4	Know the IT requirement for creating data centers	20



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3163213

CYBER CRIME AND MITIGATION

6th SEMESTER

Type of course: Undergraduate (Elective)

Prerequisite: NA

Rationale: This course explores technical, legal, and social issues related to cybercrime. The origins and extent of cybercrime, responses from legal systems to cyber-criminals, and the social impact of cybercrimes will be addressed. The course explores implementation of firewalls for different operating systems and at different layers of network architecture. The course also explores mitigation at various stages of operating systems, network and endpoint.

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

Course Contents:

Sr. No	Content	Total Hrs.	Marks Weightage (%)
1	Cyber Crimes: Definition and Origin of the Word, Cyber Crime and Information Security, Who are Cyber Criminals, Classification of cyber crimes, E-mail Spoofing, Spamming, Forgery, Hacking, Online Fruads, Software Piracy, Computer Sabotage Email Bombing, Computer Network Intrusion, Password Sniffing, Credit Card Frauds, Phishing, vishing, Identity Theft, Social Engineering, CPU Hijackers, Darknets and Dark Markets.	9	20
2	Definition and Terminology (Information Technology Act, 2000): Cyber Crime : The Legal Perspectives, The Cyber Crime Indian Perspectives, The Cyber Crime And Indian ITA 2000/2001, Hacking and Indian Laws, Global Perspective on Cyber Crime , Cyber Crime and extended Enterprise, Cybercrime and punishment, Cyber Crime Era : Survival Mantra for Netizens.	4	5
3	Firewalls: Windows Host based Firewall, Windows Firewall Control, Linux Host based Firewalls-iptables, UFW, gufw & nftables, Mac - Host based Firewalls - pflist, Icefloor & Murus, Little Snitch, Network based firewalls -Routers - DD-WRT,Hardware, pfSense, Smoothwall and Vyos.	8	15



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3163213

4	Operating System Security and Privacy: Security features and functionalities, Security bugs and vulnerabilities, OS Privacy and Tracking, General Use Operating Systems With a Security and Privacy Focus, Penetration Testing and Ethical Hacking Focused Operating Systems, Mobile Operating Systems with Security & Privacy Focus.	8	20
5	Network Security: Network Attacks and Network Isolation, Wi-Fi Weaknesses, Wi-Fi Security Testing-Secure Configuration and Network Isolation, Network Monitoring for threats, search engine and privacy , Browser Security Password and authentication methods	8	20
6	End Point Protection: File and Disk Encryption, Next Generation - Anti-Virus (NG-AV) & End-Point-Protection (NG-EPP), End Point Protection Technology, Threat Detection and Monitoring, Email- Security and Privacy Messengers - Security and Privacy.	8	20

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	25	15	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. Cyber Security : Understanding Cyber Crimes , Computer Forensics and Legal Perspectives By Nina Godbole, Sunit Belapur , Wiley
2. Understanding Cyber Crime: Phenomena and Legal Challenges Response, ITU 2012
3. Building Internet Firewalls: Internet and Web Security by Elizabeth D. Zwicky, Simon Cooper, , D. Brent Chapman, Addison -Wesley Professional Computing Series
4. Penetration Testing with Shellcode: Detect, exploit, and secure network-level and operating system vulnerabilities by Hamza Megahed ,Packt Publishing Publisher
5. Network Monitoring and Analysis: A Protocol Approach to Troubleshooting by Ed Wilson, Prentice Hall publisher (January 9, 2000)
6. Symantec Endpoint Protection Standard Requirements by Gerardus Blokdyk,5 STAR Cooks publisher



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3163213

Course Outcome:

After learning the course the students should be able to:

Sr. No.	CO Statement	Marks % Weightage
CO-1	To identify and describe the major types of cybercrime.	10
CO-2	To understand the law with regards to the investigation and prosecution of cyber criminals.	15
CO-3	To configure operating system security, privacy, and patching - On Windows, MacOS and Linux.	20
CO-4	To Configure firewalls on all platforms for all types of attack scenarios.	15
CO-5	To develop practical skill set in ensuring network security against all threats.	20
CO-6	To diversify technologies offered by end-point-protection software, from traditional approaches, through to next generation and future technology.	20