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	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

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)

	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". Students learn how to build this way of thinking, in this topic.	
2	**Creating Value** 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.	Same as above
3	**Engaging deeply** 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.	Same as above
4	**Enlightened self-interest & collaboration at work** 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").	Same as above
5	**Human-centered thinking & Empathy** 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.	Same as above
6	**Trust Conduct** 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.	Same as above
Showcase Lab Sessions		3 hrs
Project work		Beyond classroom

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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.

- Todays 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	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

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** - Glorius Past - Part 1	2
8	**My India My Pride** - Glorius Past - Part 2	2

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 Cititzen - 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.*

Modul e 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
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
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.

GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engineering
Subject Code: 3160704
THEORY OF COMPUTATION
6thSEMESTER

Type of course: NA

Prerequisite: Calculus, Data Structures and Algorithms, Set Theory

Rationale: Theory of computation teaches how efficiently problems can be solved on a model of computation. The main thrust is to identify the limitations of the computers through formalizing computation (by introducing several models including Turing Machines) and applying mathematical techniques to the formal models obtained. It is also necessary to learn the ways in which computer can be made to think. Finite state machines can help in natural language processing which is an emerging area.

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	1	0	5	70	30	0	0	100

Content:

Sr No	Course content	Total Hrs	%Wei ghtage
1	**Review of Mathematical Theory:** Sets, Functions, Logical statements, Proofs, Relations, Languages, Principal of Mathematical Induction, Strong Principle, Recursive Definitions, Structural Induction.	04	10
2	**Regular Languages and Finite Automata**: Regular Expressions, Regular Languages, Application of Finite Automata, Automata with output - Moore machine & Mealy machine, Finite Automata, Memory requirement in a recognizer, Definitions, union- intersection and complement of regular languages, Non Deterministic Finite Automata, Conversion from NFA to FA, ∧ - Non Deterministic Finite Automata, Conversion of NFA- ∧ to NFA, Kleene's Theorem, Minimization of Finite automata, Regular And Non Regular Languages – pumping lemma.	12	25
3	**Context free grammar (CFG):** Definitions and Examples, Unions Concatenations And Kleene's of Context free language, Regular Grammar for Regular Language, Derivations and Ambiguity , Unambiguous CFG and Algebraic Expressions, BacosNaur Form (BNF), Normal Form – CNF.	08	15
4	**Pushdown Automata, CFL And NCFL:** Definitions, Deterministic PDA, Equivalence of CFG and PDA & Conversion, Pumping lemma for CFL, Intersections and Complements of CFL, Non-CFL.	08	15
5	**Turing Machine (TM):**	08	15

	TM Definition, Model Of Computation, Turing Machine as Language Acceptor, TM that Compute Partial Function, Church Turning Thesis, Combining TM, Variations Of TM, Non Deterministic TM, Universal TM, Recursively and Enumerable Languages, Context sensitive languages and Chomsky hierarchy.		
6	**Computable Functions:** Partial - Total - Constant Functions, Primitive Recursive Functions, Bounded Mineralization, Regular function, Recursive Functions, Quantification, Minimalization, and µ-Recursive Functions, All Computable Functions Are µ-Recursive	04	10
7	**Undecidability :** A Language That Can't Be Accepted, and a Problem That Can't Be Decided , Non Recursive Enumerable (RE) Language – Undecidable Problem with RE – Undecidable Problems about TM – Undecidable Problems Involving Context-Free Languages, Post's Correspondence Problem, The Class P and NP.	04	10

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
15	**25**	**25**	**5**	**00**	**00**

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 Languages and the Theory of Computation, 4th by John Martin, Tata Mc Graw Hill
2. An introduction to automata theory and formal languages By Adesh K. Pandey, Publisher: S.K. Kataria& Sons
3. Introduction to computer theory By Deniel I. Cohen , Joh Wiley & Sons, Inc
4. Computation: Finite and Infinite By Marvin L. Minsky Prentice-Hall
5. Compiler Design By Alfred V Aho, Addison Weslley
6. Introduction to the Theory of Computation By Michael Sipser
7. Automata Theory, Languages, and Computation By John Hopcroft, Rajeev Motowani, and Jeffrey Ullman

Course Outcome:

Sr. No.	CO statement	Marks % weightage
CO-1	Use the concepts and techniques of discrete mathematics for theoretical computer science.	10%

CO-2	Identify different formal languages and their relationship.	25%
CO-3	Classify and construct grammars for different languages and vice-versa.	25%
CO-4	Build finite automata, push down automata and turing machine.	25%
CO-5	Analyze various concepts of undecidability and Computable Function and Discuss analytically and intuitively for problem-solving situation.	15%

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.geeksforgeeks.org/introduction-of-theory-of-computation/

4. http://www.vssut.ac.in/lecture_notes/lecture1428551440.pdf

5. https://nptel.ac.in/courses/106/104/106104028/

GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3160707
Semester – VI
Subject Name: Advance java Programming

Type of course: Elective

Prerequisite: Java Programming

Rationale: Web application based on Java uses Servlet, JSP, JSF. To store the data database connectivity and database JDBC component is needed. Networking components are needed to transfer data over network. Model-View-Controller (MVC) architecture gives flexibility and makes the web applications loosely coupled.

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 Weight age (%)
1	Java Networking Network Basics and Socket overview, TCP/IP client sockets, URL, TCP/IP server sockets, Datagrams, java.net package Socket, ServerSocket, InetAddress, URL, URLConnection	04	05
2	JDBC Programming The JDBC Connectivity Model, Database Programming: Connecting to the Database, Creating a SQL Query, Getting the Results, Updating Database Data, Error Checking and the SQLException Class, The SQLWarning Class, The Statement Interface, PreparedStatement, CallableStatement The ResultSet Interface, Updatable Result Sets, JDBC Types, Executing SQL Queries, ResultSetMetaData, Executing SQL Updates, Transaction Management.	06	10
3	Servlet API and Overview Servlet Model: Overview of Servlet, Servlet Life Cycle, HTTP Methods Structure and Deployment descriptor ServletContext and ServletConfig interface, Attributes in Servelt, Request Dispacher interface	08	25

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	The Filter API: Filter, FilterChain, Filter Config Cookies and Session Management: Understanding state and session, Understanding Session Timeout and Session Tracking, URL Rewriting		
4	Java Server Pages JSP Overview: The Problem with Servlets, Life Cycle of JSP Page, JSP Processing, JSP Application Design with MVC, Setting Up the JSP Environment, JSP Directives, JSP Action, JSP Implicit Objects JSP Form Processing, JSP Session and Cookies Handling, JSP Session Tracking JSP Database Access, JSP Standard Tag Libraries, JSP Custom Tag, JSP Expression Language, JSP Exception Handling, JSP XML Processing	06	25
5	Java Server Faces2.0 Introduction to JSF, JSF request processing Life cycle, JSF Expression Language, JSF Standard Component, JSF Facelets Tag, JSF Convertor Tag, JSF Validation Tag, JSF Event Handling and Database Access, JSF Libraries: PrimeFaces	06	10
6	Hibernate 4.0 Overview of Hibernate, Hibernate Architecture, Hibernate Mapping Types, Hibernate O/R Mapping, Hibernate Annotation, Hibernate Query Language	06	15
7	Java Web Frameworks: Spring MVC Overview of Spring, Spring Architecture, bean life cycle, XML Configuration on Spring, Aspect – oriented Spring, Managing Database, Managing Transaction	06	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	Implement Networking and Data base connectivity in Java for given application.	30
CO-2	Implement webpage with dynamic content and server side web application using Servlet and JSP.	40
CO-3	Use web application framework JSF to build user interfaces.	10
CO-4	Use Object Relation Mapping using Hibernate to build database	10

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		dependent applications	
CO-5		Apply Model-View-Controller architecture to build complex client-server applications.	10

Books

1) Black Book " Java server programming" J2EE, 1st ed., Dream Tech Publishers, 2008. 3. Kathy walrath "
2) Complete Reference J2EE by James Keogh mcgraw publication
3) Professional Java Server Programming by Subrahmanyam Allamaraju, Cedric Buest Wiley Publication
4) SCWCD, Matthew Scarpino, Hanumant Deshmukh, Jignesh Malavie, Manning publication
5) Core Java, Volume II: Advanced Features by Cay Horstmann and Gary Cornell Pearson Publication
6) Java Persistence with Hibernate by Christian Bauer, Gavin King
7) Spring in Action 3rd edition , Craig walls, Manning Publication
8) Hibernate 2nd edition, Jeff Linwood and Dave Minter, Beginning Après publication
9) Java Server Faces in Action, Kito D. Mann, Manning Publication
10) JDBC™ API Tutorial and Reference, Third Edition, Maydene Fisher, Jon Ellis, Jonathan Bruce, Addison Wesley
11) Beginning JSP, JSF andTomcat, Giulio Zambon, Apress
12) JSF2.0 CookBook, Anghel Leonard, PACKT publication
13) Advanced Java, M. T. Savaliya, dreamtech

List of Practical:

1. Implement TCP Server for transferring files using Socket and ServerSocket.
2. Implement cookies to store firstname and lastname using Java server pages.
3. Implement the shopping cart for users for the online shopping. Apply the concept of session.
4. Implement student registration form with enrollment number, first name, last name, semester, contact number. Store the details in database. Also implement search, delete and modify facility for student records.
5. Write a Servlet program to print system date and time.
6. Design a web page that takes the Username from user and if it is a valid username prints "Welcome Username". Use JSF to implement.
7. Write Hibernate application to store customer records and retrieve the customer record including name, contact number, address.
8. Write an application to keep record and retrieve record of student. The record includes student id, enrollment number, semester, SPI. Use MVC arechitecture.

List of Open Source Software/learning website:
1. https://www.tutorialspoint.com/
2. https://www.geeksforgeeks.org/introduction-java-servlets/

GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engineering
Subject Code: 3160712
MICROPROCESSOR AND INTERFACING
6TH SEMESTER

Type of course: Core course

Prerequisite: Fundamentals of Digital Logic Design and Computer Organization

Rationale: The modern digital systems including computer systems are designed with microprocessor as central device connected to memory and I/O devices. The subject introduces the students with basics of microprocessor, microprocessor architecture and programming, interfacing microprocessor with memory and various I/O (Input/Output) devices.

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	% Weight age
1	Introduction to Microprocessor, Components of a Microprocessor: Registers, ALU and control & timing, System bus (data, address and control bus), Microprocessor systems with bus organization	4	8%
2	Microprocessor Architecture and Operations, Memory, I/O devices, Memory and I/O operations	4	7%
3	8085 Microprocessor Architecture, Address, Data And Control Buses, 8085 Pin Functions, Demultiplexing of Buses, Generation Of Control Signals, Instruction Cycle, Machine Cycles, T-States, Memory Interfacing	6	12%
4	Assembly Language Programming Basics, Classification of Instructions, Addressing Modes, 8085 Instruction Set, Instruction And Data Formats, Writing, Assembling & Executing A Program, Debugging The Programs	6	13%
5	Writing 8085 assembly language programs with decision, making and looping using data transfer, arithmetic, logical and branch instructions	6	12%
6	Stack & Subroutines, Developing Counters and Time Delay Routines, Code Conversion, BCD Arithmetic and 16-Bit Data operations	6	13%
7	Interfacing Concepts, Ports, Interfacing Of I/O Devices, Interrupts In 8085, Programmable Interrupt Controller 8259A, Programmable Peripheral Interface 8255A	8	20%
8	Advanced Microprocessors : 8086 logical block diagram, segmentation, Pin functions, Minimum and maximum mode, 80286/80386: Overview and architecture, Programming model, Data types and instruction set, segments and its types, segment descriptor, descriptor table and selectors	8	15%

Reference Books:

1. Microprocessor Architecture, Programming, and Applications with the 8085, Ramesh S. Gaonkar Pub: Penram International.
2. 8086 Programming and Advance Processor Architecture, Savaliya M. T., WileyIndia
3. The 8088 and 8086 Microprocessors, Triebel & Singh, Pearson Education
4. Microprocessors and Interfacing, N. Senthil Kumar, M. Saravanan, S. Jeevanathan, S. K. Shah, Oxford
5. Advanced Microprocessors, Daniel Tabak, McGrawHill
6. Microprocessor & Interfacing - Douglas Hall, TMH

Course Outcome:

Sr. No	CO Statement	Weightage
CO1	Demonstrate the various features of microprocessor, memory and I/O devices including concepts of system bus.	15%
CO2	Identify the hardware elements of 8085 microprocessor including architecture and pin functions and programming model including registers, instruction set and addressing modes.	25%
CO3	Select appropriate 8085 instructions based on size and functions to write a given assembly language program.	25%
CO4	Design a given interfacing system using concepts of memory and I/O interfacing.	20%
CO5	Demonstrate the features of advance microprocessors.	15%

List of Experiments:

Practical list should be prepared based on the content of the subject and following guidelines should be useful.

- 8085 assembly language programmes covering all the instructions.
- Interfacing practicals using I/O instructions

Design based Problems (DP)/Open Ended Problem:
1. Develop an 8085 Assembly language program to implement the Booth's algorithm to multiply two 8-bit numbers.
2. Develop an 8085 Assembly language program to implement division of two 8-bit numbers.
3. Design a program for Digital Clock with format HH:MM:SS (Address and data field) using inbuild routines of monitor program of your system.
4. Compare the microprocessor and microcontrollers from hardware and software point of view.
5. Prepare a detail report on evaluating overall performance of a microprocessor chip.

Major Equipment:

- 8085 based microprocessor kit
- Modern desktop PC with open source 8085 Simulator

List of Open Source Software/learning website:

- Open source simulator for 8085 processor
- www.nptel.ac.in
- www.intel.com
- **www.cpu-world.com**

GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engineering
Subject Code: 3160713
WEB Programming
6th SEMESTER

Type of course: Professional Elective

Prerequisite: Programming, TCP/IP protocols and client-server development

Rationale: Today's world is driven by Internet based applications. The rationale behind this course is to impart the knowledge of web programming among students of computer engineering. This course covers web programming for both client-side and server-side to develop complete web based applications for various requirements

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	% Weightage
1	**Introduction to WEB** Basics of WWW, HTTP protocol, Client Server architecture, Introduction to web server installation and configuration	04	7%
	Web Design Concepts of effective web design, Web design issues including Browser, Bandwidth and Cache, Display resolution, Look and Feel of the Website, Page Layout and linking, User centric design, Sitemap, Planning and publishing website, Designing effective navigation	04	8%
2	**Basics of HTML and CSS** Structure of HTML page, HTML tags for data formatting, tables, links, images, meta tags, frames, html form tags, media, APIs, HTML5 tags and validation. Need for CSS, Syntax and structure, CSS rules for Backgrounds, Colors and properties, Manipulating texts, Fonts, borders and boxes, Margins, Padding Lists, CSS Positioning. Animations, Tool-Tips, Style images, Variables, Media Queries, Wildcard Selectors (*, ^ and $) in CSS, Working with Gradients, Pseudo Class, Pseudo elements, basic of frameworks like Bootstrap	08	15%
3	**Client Side Scripting using JavaScript** Syntax of JavaScript, Execution of JavaScript, Internal, Embedded and External Javascript, JavaScript : variables, arrays, functions, conditions, loops, Pop up boxes, JavaScript objects and DOM, JavaScript inbuilt functions, JavaScript validations and Regular expressions, Event handling with JavaScript, Callbacks in Javascript, Function as arguments in JavaScript, Introduction to JSON	10	20%

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4	**Server Side Programming with PHP** Difference between Client side and Server side scripting, Structure of PHP page, PHP Syntax: variables, decision and looping with examples, PHP and HTML, Arrays and Functions, String, Form processing, File uploads, Dates and time zone, Working with Regular Expressions, Exception Handling , Basic concepts of Session and State, State management using query string, hidden form controls, Cookies, Session variables	10	25%
6	**Database programming with PHP and MySQL** Basic MySQL commands, PHP functions for database connectivity, Implementation of CRUD operations using PHP, Prepared Statement and stored procedure execution in PHP	04	10%
7	**Advanced Web Programming concepts** Asynchronous Web Programming, Difference between synchronous and asynchronous web programming, AJAX, and JQuery, Web service and API development using PHP	08	15%

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)

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. Web Technology, Moseley and Savaliya, Wiley India
2. HTML 5 Black Book 2Ed, Kogent Learning Solutions Inc, dreamtech
3. Web Design, Joel Sklar, Cengage Learning
4. Learning PHP, MySQL, JavaScript, CSS & HTML5, 3rd Edition, Robin Nixon, O'Reilly
5. A Step-by-Step Guide to Creating Dynamic Websites By Robin Nixon Publisher: O'Reilly Media
6. Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel, Pearson
7. JavaScript for impatient programmers, Dr. Axel Rauschmayer
8. PHP: The Complete Reference By Steven Holzner, McGrawhill

Course Outcome

Sr. No.	CO statement	Marks % weightage
CO-1	Use the various HTML tags with appropriate styles to display the various types of contents effectively	20

CO-2	Develop the dynamic web pages using HTML, CSS and JavaScript applying web design principles to make pages effective.	30
CO-3	Develop the server side PHP scripts using various features for creating customized web services.	25
CO-4	Write the server side scripts for designing web based services with database connectivity.	10
CO-5	Develop a web application using advanced web programming features including AJAX and JQuery using concepts of Web API.	15

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:
1. **HTML:**
   a. https://developer.mozilla.org/en-US/docs/Web/HTML
   b. https://www.w3schools.com/html/
   c. https://www.tutorialspoint.com/html/index.htm
2. **CSS:**
   a. https://developer.mozilla.org/en-US/docs/Web/CSS
   b. https://www.manning.com/books/css-in-depth
   c. https://www.w3schools.com/css/
   d. https://www.tutorialspoint.com/css/index.htm
3. **Java Script:**
   a. https://javascript.info/
   b. https://github.com/getify/You-Dont-Know-JS
   c. https://www.w3schools.com/js/
   d. https://www.tutorialspoint.com/javascript/index.htm
4. **PHP:**
   a. https://www.w3schools.com/php/
   b. https://www.tutorialspoint.com/php/index.htm

GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engineering
Subject Code: 3160714
DATA MINING
6th SEMESTER

Type of course: Under graduate (Elective)

Prerequisite: NA

Rationale: NA

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.	% Weightage
1	**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	10
2	**Data Pre-processing:** Data summarization, data cleaning, data integration and transformation, data reduction, data discretization and concept hierarchy generation, feature extraction , feature transformation, feature selection, introduction to Dimensionality Reduction, CUR decomposition	4	15
3	**Concept Description, Mining Frequent Patterns, Associations and Correlations:** What is concept description? - Data Generalization and summarization-based characterization - Attribute relevance - class comparisons, Basic concept, efficient and scalable frequent item-set mining methods, mining various kind of association rules, from association mining to correlation analysis, Advanced Association Rule Techniques, Measuring the Quality of Rules.	10	20
4	**Classification and Prediction:** Classification vs. prediction, Issues regarding classification and prediction, Statistical-Based Algorithms, Distance-Based Algorithms, Decision Tree-Based Algorithms, Neural Network-Based Algorithms, Rule-Based Algorithms, Combining Techniques, accuracy and error measures, evaluation of the accuracy of a classifier or predictor. Neural Network Prediction methods: Linear and nonlinear regression, Logistic Regression Introduction of tools such as DB Miner / WEKA / DTREG DM Tools	10	20
5	**Cluster Analysis:** Clustering: Problem Definition, Clustering Overview, Evaluation of Clustering Algorithms, Partitioning Clustering -K-Means Algorithm, K-Means Additional issues, PAM Algorithm; Hierarchical Clustering – Agglomerative Methods and divisive methods, Basic Agglomerative	10	20

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	Hierarchical Clustering, Strengths and Weakness; Outlier Detection, Clustering high dimensional data, clustering Graph and Network data.		
6	**Web mining and other data mining:** Web Mining: Introduction to Web Mining, Web content mining, Web usage mining, Web Structure mining, Web log structure and issues regarding web logs, Spatial Data Mining, Temporal Mining, And Multimedia Mining. Applications of Distributed and parallel Data Mining.	5	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. M. Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education.
4. Ning Tan, Vipin Kumar, Michael Steinbanch Pang, "Introduction to Data Mining", Pearson Education

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

Sr. No.	CO statement	Marks % weightage
CO-1	Perform the preprocessing of data and apply mining techniques on it.	20
CO-2	Identify the association rules, classification, and clusters in large data sets.	30
CO-3	Solve real world problems in business and scientific information using data mining.	20
CO-4	Use data analysis tools for scientific applications.	15
CO-5	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.

Type of course: Elective

Prerequisite: Data Structures, Operating Systems, Microprocessor & Interfacing

Rationale: NA

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	% Weightage
1	**Overview of System Software** Introduction, Software, Software Hierarchy, Systems Programming, Machine Structure, Interfaces, Address Space, Computer Languages, Tools, Life Cycle of a Source Program, Different Views on the Meaning of a Program, System Software Development, Recent Trends in Software Development, Levels of System Software	04	10%
2	**Overview of Language Processors** Programming Languages and Language Processors, Language Processing Activities, Program Execution, Fundamental of Language Processing, Symbol Tables Data Structures for Language Processing: Search Data structures, Allocation Data Structures.	04	10%
3	**Assemblers** Elements of Assembly Language Programming, Design of the Assembler, Assembler Design Criteria, Types of Assemblers, Two-Pass Assemblers, One-Pass Assemblers, Single pass Assembler for Intel x86 , Algorithm of Single Pass Assembler, Multi-Pass Assemblers, Advanced Assembly Process, Variants of Assemblers Design of two pass assembler,	05	15%
4	**Macro and Macro Processors** Introduction, Macro Definition and Call, Macro Expansion, Nested Macro Calls, Advanced Macro Facilities, Design Of a Macro Pre-processor, Design of a Macro Assembler, Functions of a Macro Processor, Basic Tasks of a Macro Processor, Design Issues of Macro Processors, Features, Macro Processor Design Options, Two-Pass Macro Processors, One-Pass Macro Processors	07	20%
5	**Linkers and Loaders**	06	20%

	Introduction, Relocation of Linking Concept, Design of a Linker, Self-Relocating Programs, Linking in MSDOS, Linking of Overlay Structured Programs, Dynamic Linking, Loaders, Different Loading Schemes, Sequential and Direct Loaders, Compile-and-Go Loaders, General Loader Schemes, Absolute Loaders, Relocating Loaders, Practical Relocating Loaders, Linking Loaders, Relocating Linking Loaders, Linkers v/s Loaders		
6	**Scanning and Parsing** Programming Language Grammars, Classification of Grammar, Ambiguity in Grammatic Specification, Scanning, Parsing, Top Down Parsing, Bottom up Parsing, Language Processor Development Tools, LEX, YACC	04	10%
7	**Compilers** Causes of Large Semantic Gap, Binding and Binding Times, Data Structure used in Compiling, Scope Rules, Memory Allocation, Compilation of Expression, Compilation of Control Structure, Code Optimization	03	8%
8	**Interpreters & Debuggers** Benefits of Interpretation, Overview of Interpretation, The Java Language Environment, Java Virtual Machine, Types of Errors, Debugging Procedures, Classification of Debuggers, Dynamic/Interactive Debugger	03	7%

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
7	30	33	-	-	-

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) System Programming by D M Dhamdhere, McGraw Hill Publication
2) System Programming by Srimanta Pal, OXFORD Publication
3) System Programming and Compiler Construction by R.K. Maurya & A. Godbole.
4) System Software – An Introduction to Systems Programming by Leland L. Beck, 3rd Edition, Pearson Education Asia, 2000
5) System Software by Santanu Chattopadhyay, Prentice-Hall India,2007

Course Outcome:

After learning the course the students should be able to:

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Sr. No.	CO statement	Marks % weightage
CO-1	Explain and classify different methodologies, concepts and approaches to System Software Programming.	15%
CO-2	Identify elements of language processors with various data structures used in development of one-pass and multi-pass assemblers.	25%
CO-3	Examine macro processor, its usage and compare various loading and linking schemes.	25%
CO-4	Build various system programs using language processor development tools such as YACC and Lex.	15%
CO-5	Design code optimization based solution for the given system problems by applying various techniques of compiler, interpreter and debugger.	20%

List of Experiments and Design based Problems (DP)/Open Ended Problem:

(Pl. Note: List of Experiments should be as per theory covered in the class, below mentioned practical are just for the reference purpose)

1. Write a program to implement the lexical analyzer.
2. Write a Lexical Analyzer (using lex utility for UNIX).
3. Write a program to left factor the given grammar.
4. Write a program to remove the Left Recursion from a given grammar.
5. Aim: Implement Recursive Descendent Parsing for the given Grammar.
   E -> T + E / T
   T -> F * T / F
   F -> (E) / i
6. Implement Predictive Parser for the given grammar.
   E -> T + E / T
   T -> F * T / F
   F -> (E) / i
7. Write a SAL program in text file and generate SYMTAB and LITTAB
8. Use macro features of C language
9. Write a program which generates Quadruple Table for the given postfix String
10. Write a C program to parse a given string using Predictive parsing for given grammar.
    type → simple | ↑id | array [simple] of type
    simple → integer | char | num dotdot num

List of Open Source Software/learning website:

- www.cs.jhu.edu/~scott/pl/lectures/parsing.html
- www.en.wikipedia.org/wiki/System_programming
- https://www.isi.edu/~pedro/Teaching/CSCI565-Fall15/Materials/LexAndYaccTutorial.pdf
- https://developer.ibm.com/technologies/systems/tutorials/au-lexyacc/

GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engineering
Subject Code: 3160716
IOT and Applications
6thSEMESTER

Type of course: Open Elective

Prerequisite: C Programming**,** Microprocessor, Networking

Rationale: Internet of Things plays an important role in connecting the things i.e. variety of devices through the Internet. The IoT has emerged as an cutting-edge technology with applications in manufacturing, healthcare, Agriculture, transport, mining, smart cities and many more. This subject covers the fundamentals of IoT with its architecture, protocols and Applications. It also covers the overview and programming of two widely used IoT platforms Arduino and Raspberry Pi.

Teaching and Examination Scheme:

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

Content:

Sr No	Course content	Total Hrs
1	**Introduction to Internet of Things:** Application areas of IoT, Characteristics of IoT, Things in IoT, IoT stack, Enabling technologies, IoT challenges, IoT levels, IoT and cyber physical system, IoT and WSN	**04**
2	**Sensors, Microcontrollers, and Their Interfacing:** Sensor interfacing, Types of sensors, Controlling sensors, Microcontrollers, ARM	**04**
3	**Protocols for IoT :** Messaging protocols, Transport protocols, IPv4, IPv6, URI	**06**
4	**Cloud for IoT:** IoT and cloud, Fog computing, Security in cloud, Case study	**04**
5	**Application Building with IoT:** Various application of IoT : Food, Healthcare, Lavatory maintenance, Water quality, Warehouse, Retail, Driver Assistance, Collision impact	**04**
6	**Arduino and Raspberry Pi:** Arduino : Architecture, Programming and Application Raspberry Pi : Architecture, Programming and Application	**06**
7	**IoT Security:** Various security issues and need, architecture, requirement, challenges and algorithms	**02**

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GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engineering
Subject Code: 3160716

Reference Books:

1. Internet of Things, Vasudevan, Nagrajan and Sundaram, Wiley India
2. IoT Fundamentals, David Hence at el, Cisco Press
3. 21 IoT Experiments, Yashavant Kanetkar, Shrirang Korde, BPB
4. IoT Based Projects, Rajesh Singh at el, BPB
5. Internet of Things with ARDUINO and BOLT, Ashwin Pajankar, BPB
6. Star Expert IoT Specialist, STAR CERTIFICATION

Course Outcomes: Students should able to

Sr. No.	CO statement	Weightage
CO-1	Demonstrate the architecture and functioning of IoT systems including the sensors and microcontrollers with their interfacing and software need considering application areas.	20
CO-2	Diagnose the various IoT protocols with detailing of their elements and overall functioning within IoT systems for efficient communication.	20
CO-3	Design an IoT system to take the benefit of the Clouds for computing and storage considering security issues.	20
CO-4	Leverage the benefits of IoT technologies for automating the various real-life challenges in various application areas.	20
CO-5	Develop the software components of IoT system using Arduino/Raspberry Pi Programming.	20

List of Practical:

Practical should be performed by students based on
- Using Arduino or Raspberry Ri boards and its software platforms

List of Open Source Software/learning website:
1. https://www.tutorialspoint.com/internet_of_things/index.htm
2. https://www.iotworldtoday.com/
3. https://aws.amazon.com/iot/
4. https://www.cisco.com/c/en_in/solutions/internet-of-things/overview.html
5. https://www.cisco.com/c/en_in/solutions/internet-of-things/iot-network-connectivity.html

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GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engineering
Subject Code: 3160717
DATA VISUALIZATION
6th SEMESTER

Type of course: Under graduate (Open Elective)

Prerequisite: Working knowledge of Programming Language, DBMS, JavaScript and HTML5

Rationale: NA

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.	% Weightage
1	**Introduction to Data Visualization:** Acquiring and Visualizing Data, Simultaneous acquisition and visualization, Applications of Data Visualization, Keys factors of Data Visualization (Control of Presentation, Faster and Better JavaScript processing, Rise of HTML5, Lowering the implementation Bar) Exploring the Visual Data Spectrum: charting Primitives (Data Points, Line Charts, Bar Charts, Pie Charts, Area Charts), Exploring advanced Visualizations (Candlestick Charts, Bubble Charts, Surface Charts, Map Charts, Infographics). Making use of HTML5 CANVAS, Integrating SVG	3	10
2	**Basics of Data Visualization – Tables:** Reading Data from Standard text files (.txt, .csv, XML), Displaying JSON content Outputting Basic Table Data (Building a table, Using Semantic Table, Configuring the columns), Assuring Maximum readability (Styling your table, Increasing readability, Adding dynamic Highlighting), Including computations, Using data tables library, relating data table to a chart	5	15
3	**Visualizing data Programmatically:** Creating HTML5 CANVAS Charts (HTML5 Canvas basics, Linear interpolations, A Simple Column Chart, Animations), Starting with Google charts (Google Charts API Basics, A Basic bar chart, A basic Pie chart, Working with Chart Animations).	5	25
4	**Introduction to D3.js:** Getting setup with D3, Making selections, changing selection's attribute, Loading and filtering External data : Building a graphic that uses all of the population distribution data, Data formats you can use with D3, Creating a server to upload your data, D3's function for loading data, Dealing with Asynchronous requests, Loading and formatting Large Data Sets	5	15
5	**Advanced Data Visualization:** Making charts interactive and Animated: Data joins, updates and exits, interactive buttons, Updating charts, Adding transactions, using keys Adding a Play Button:	4	15

	wrapping the update phase in a function, Adding a Play button to the page, Making the Play button go, Allow the user to interrupt the play, sequence		
6	**Information Dashboard Design:** Introduction, Dashboard design issues and assessment of needs, Considerations for designing dashboard-visual perception, Achieving eloquence, Advantages of Graphics _Library of Graphs, Designing Bullet Graphs, Designing Sparklines, Dashboard Display Media, Critical Design Practices, Putting it all together - Unveiling the dashboard.	6	20

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
15	**20**	**20**	**5**	**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. Jon Raasch, Graham Murray, Vadim Ogievetsky, Joseph Lowery, "JavaScript and jQuery for Data Analysis and Visualization", WROX

2. Ritchie S. King, Visual story telling with D3" Pearson

3. Ben Fry, "Visualizing data: Exploring and explaining data with the processing environment", O'Reilly, 2008.

4. A Julie Steele and Noah Iliinsky, Designing Data Visualizations: Representing Informational Relationships, O'Relly

5. Andy Kirk, Data Visualization: A Successful Design Process, PAKT

6. Scott Murray, Interactive Data Visualization for Web, O'Relly

7. Nathan Yau, "Data Points: Visualization that means something", Wiley, 2013.

8. Tamara Munzner, Visualization Analysis and Design, AK Peters Visualization Series, CRC Press, Nov. 2014

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

Sr. No.	CO statement	Marks % weightage
CO-1	Explore various data visualization techniques in order to provide new insight.	20
CO-2	Apply appropriate data visualization techniques to provide trends/insights for the given dataset.	35
CO-3	Apply visualization tools / techniques for various data analysis tasks.	30
CO-4	Given the application context for given data set, Design the information Dashboard for access information based on user criteria.	15

List of Experiments:

1. Setup Environment for All the Tools
2. Develop the following Program Using HTML5 CANVAS and SVG TAG
   a. Develop the Different basic Graphical Shapes using HTM5 CANVAS
   b. Develop the Different Advanced Graphical Shapes using HTM5 CANVAS
   c. Develop the Different basic Graphical Shapes using HTM5 SVG
   d. Develop the Different Advanced Graphical Shapes using HTM5 SVG
3. Develop Following Program Using HTML5 and JavaScript
   a. Develop the simple bar chart usingTML5 CANVAS
   b. Read the data .txt file and draw Data Table
   c. Read the data .txt file and draw Simple Bar Chart
   d. Read the data .csv file and draw Data Table
   e. Read the data .csv file and draw Column Bar Chart
   f. Read the data XML file and draw Data Table
   g. Read the data XML file and draw Simple Chart
   h. Read JSON Data and draw Data Table
   i. Read JSON Data and draw Simple Chart
4. Develop Following Program Using HTML5 and D3.js and Canvas.js
   a. Showing the data as a column chart (simple)
   b. Showing the data as a stacked column chart
   c. Showing the Data as a column chart for four age group
   d. Showing the data as a Line chart (single, fewer and multiple lines)
   e. Showing the data as a Pie Chart (single and multiple pie)
   f. Showing the data as a Bar Chart (Simple and multiple)
5. Develop Following Program Using HTML5 and Google Chats API and Map API
   a. Using Google Charts API Basics draw charts like a Bar chart
   b. Using Google Charts API Basics draw charts like a Line chart
   c. Using Google Charts API Basics draw PieChart.
   d. Using Google Charts API Basics draw Donut Chart.
   e. Using Google Charts API Basics draw Candle Chart.
   f. Using Google Charts API Basics draw other types of Chart.
   g. Using Google API read JSON file and create Google Map.
6. Build interconnected Dashboard using

List of Open Source Software/learning website:

- HTML5 (Canvas and SVG tags)
- D3.js (https://d3js.org/), Canvas.js
- Google API