



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)



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	<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



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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



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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%



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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



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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



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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



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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

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Subject Code: 3161604

IMAGE PROCESSING

Semester-VI

Type of course: Professional Elective Course-II

Prerequisite:

1. Knowledge of Fourier transform
2. Probability theory
3. Good programming skills.

Rationale:

This course will provide students with more techniques in the digital image processing for image enhancement as well as restoration of noisy images. Emphasis is given more on implementation of various algorithms so that students will be able to develop their own algorithm. The techniques covered in the syllabus have wide applicability in any field which needs to handle the image data.

Teaching and Examination Scheme:

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

Content:

Sr No	Course Content	No of Hrs.	% Weight
1	<u>Digital image fundamentals:</u> Light and Electromagnetic spectrum, Components of Image processing system, Image formation and digitization concepts, Neighbors of pixel adjacency connectivity, regions and boundaries, Distance measures, Applications.	05	20
2	<u>Image Enhancements:</u> In spatial domain: Basic gray level transformations, Histogram processing, Using arithmetic/Logic operations, smoothing spatial filters, Sharpening spatial filters. In Frequency domain: Introduction to the Fourier transform and frequency domain concepts, smoothing frequency-domain filters, Sharpening frequency domain filters.	15	30
3	<u>Image Restoration:</u> Various noise models, image restoration using spatial domain filtering, image restoration using frequency domain filtering, Estimating the degradation function, Inverse filtering.	05	20
4	<u>Colour Image processing:</u> Colour fundamentals, Colour models, Colour transformation, Smoothing and Sharpening, Colour segmentation.	03	05
5	<u>Wavelet and Multi-resolution processing:</u> Image pyramids, Multi-resolution expansion, wavelet transform.	03	10
6	<u>Image compression:</u> Introduction, Image compression model, Error-free compression, Lossy compression.	03	05



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7	Image segmentation: Detection of discontinuities, Edge linking and boundary detection, thresholding.	03	10
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Suggested Specification table with Marks (Theory):

Distribution of Theory Marks				
R Level	U Level	A Level	N Level	E Level
20	20	15	10	05

Legends: R : Remembrance ; U = Understanding; A = Application; N= Analyze and E=Evaluation 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 Image Processing, Second Edition by Rafael C. Gonzalez and Richard E. Woods, Pearson Education
2. Digital Image Processing by Bhabatosh Chanda and Dwijesh Majumder, PHI
3. Fundamentals of Digital Image Processing by Anil K Jain, PHI
4. Digital Image Processing Using Matlab, Rafael C. Gonzalez and Richard E. Woods, Pearson Education

Course Outcomes: Students will be able to

Sr. No.	CO statement	Marks % weightage
CO-1	<u>Understand</u> the various digital image processing techniques in spatial/ frequency domain	45
CO-2	<u>Apply</u> various tools and techniques for digital image quality enhancement in spatial/frequency domain	35
CO-3	<u>Analyse</u> image to <u>evaluate</u> quality of the digital image	15
CO-4	<u>Design</u> real time application using digital image processing concepts	05

List of Experiments:

- Experiments will be based on the topics taught in the theory.

Major Equipment:

1. Computer system with high computing power and main memory.

List of Open Source Software/learning website:

1. MATLAB with image processing toolbox.
2. Scilab (SIP)

Open ended problems:



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1. Enhance the given degraded image (pick up any suitable degraded image which contains letters also) such that we may be able to read the letter properly. Try to get best possible quality of image.
2. Identify type of the noise present in the image using frequency as well as in spatial domain concepts and judge the basic behavioral characteristics of the various noises.
3. Capture the real time binary photo and apply the various segmentation algorithms to identify the various objects presents in the image (i.e road, trees, river etc.)
4. Assign face recognition problem.

GTUQuestionPapers.com



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3161605
SOFTWARE ENGINEERING
Semester VI

Type of course: NA

Prerequisite: Object Oriented Programming fundamental, UML

Rationale:

- To study Software Development Life Cycle, Development models and Agile Software development.
- To study fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods.
- To discuss various software testing issues and solutions in software unit test; integration, regression, and system testing.
- To learn the process of improving the quality of software work products.
- To gain the techniques and skills on how to use modern software testing tools to support software testing projects.
- To expose Software Process Improvement and Reengineering

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 Software and Software Engineering The Evolving Role of Software, Software: A Crisis on the Horizon and Software Myths, Software Engineering: A Layered Technology, Software Process Models, The Linear Sequential Model, The Prototyping Model, The RAD Model, Evolutionary Process Models, Agile Process Model, Component-Based Development, Process, Product and Process.	05	14%
2.	Agile Development Agility and Agile Process model, Extreme Programming, Other process models of Agile Development and Tools.	03	08%



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3	Managing Software Project Software Metrics (Process, Product and Project Metrics), Software Project Estimations, Software Project Planning (MS Project Tool), Project Scheduling & Tracking, Risk Analysis & Management (Risk Identification, Risk Projection, Risk Refinement, Risk Mitigation).	04	10%
4	Requirement Analysis and Specification Understanding the Requirement, Requirement Modeling, Requirement Specification (SRS), Requirement Analysis and Requirement Elicitation, Requirement Engineering.	03	8%
5	Software Design Design Concepts and Design Principal, Architectural Design, Component Level Design (Function Oriented Design, Object Oriented Design), User Interface Design, Web Application Design.	04	10%
6.	Software Coding & Testing Coding Standard and coding Guidelines, Code Review, Software Documentation, Testing Strategies, Testing Techniques and Test Case, Test Suites Design, Testing Conventional Applications, Testing Object Oriented Applications, Testing Web and Mobile Applications, Testing Tools (Win runner, Load runner).	05	15%
7	Quality Assurance and Management Quality Concepts and Software Quality Assurance, Software Reviews (Formal Technical Reviews), Software Reliability, The Quality Standards: ISO 9000, CMM, Six Sigma for SE, SQA Plan.	03	10%
8	Software Maintenance and Configuration Management Types of Software Maintenance, Re-Engineering, Reverse Engineering, Forward Engineering, The SCM Process, Identification of Objects in the Software Configuration, Version Control and Change Control	03	10%
9.	DevOps: Overview, Problem Case Definition, Benefits of Fixing Application Development Challenges, DevOps Adoption Approach through Assessment, Solution Dimensions, What is DevOps?, DevOps Importance and Benefits, DevOps Principles and Practices, 7 C's of DevOps Lifecycle for Business Agility, DevOps and Continuous Testing, How to Choose Right DevOps Tools, Challenges with DevOps Implementation, Must Do Things for DevOps, Mapping My App to DevOps -	04	10%



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Subject Code: 3150711

	Assessment, Definition, Implementation, Measure and Feedback		
10	Advanced Topics in Software Engineering Component-Based Software Engineering, Client/Server Software Engineering, Web Engineering, Reengineering, Computer-Aided Software Engineering, Software Process Improvement, Emerging Trends in software Engineering.	02	5%

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
15	25	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. Roger S.Pressman, Software Engineering- A practitioner's Approach, McGraw-Hill International Editions
2. Ian Sommerville, Software engineering, Pearson education Asia
3. Pankaj Jalote, Software Engineering – A Precise Approach Wiley
4. Behhforoz & Frederick Hudson, Software Engineering Fundamentals, OXFORD
5. Rajib Mall, Fundamentals of software Engineering, Prentice Hall of India.
6. Deepak Gaikwad, Viral Thakkar, DevOps Tools from Practitioner's ViewPoint, Wiley
7. Merlin Dorfman (Editor), Richard H. Thayer (Editor) ,Software Engineering
8. Robert C. "Uncle Bob" Martin , Clean Architecture: A Craftsman's Guide to Software Structure and Design

Course Outcome:

After learning the course the students should be able to:

1. Prepare SRS (Software Requirement Specification) document and SPMP (Software Project Management Plan) document.
2. Apply the concept of Functional Oriented and Object Oriented Approach for Software Design.
3. Recognize how to ensure the quality of software product, different quality standards and software review techniques.
4. Apply various testing techniques and test plan in.
5. Able to understand modern Agile Development



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List of Experiments:

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

Tutorial-1

Study the complete Software Development Life Cycle (SDLC) and analyze various activities conducted as a part of various phases. For each SDLC phase, **identify** the objectives and **summaries** outcomes.

Tutorial-2

Consider any project to be developed in any technology as a Software Architect or Project Manager. **Construct** Software Requirement Specification (SRS) document for the project.

Tutorial-3

Considering your immense expertise in software development, The Absolute Beginners Inc. has recently allotted you a mega project. The goal of the project is to create a database of all Hindi films released since 2000. The software would allow one to generate a list of top ten hit films, top ten flop films, best comedy films, and so on. Using your prior experience you have decided the approximate sizes of each module of the software as follow:

- Data entry (0.9 KDSI)
- Data update (0.7 KDSI)
- Query (0.9 KDSI)
- Report generation and display (2 KDSI)

Also take into consideration the following cost drivers with their ratings:

- Storage constraints (Low)
- Experience in developing similar software (High)
- Programming capabilities of the developers (High)
- Application of software engineering methods (High)
- Use of software tools (High)

(All other cost drivers have nominal rating).

Now answer the following:

- **Solve** the problem by **Applying** Basic and intermediate COCOMO
 - Find Project Type?
 - Find Project Size?
 - Find Initial Effort Estimation?
 - Find Adjusted Effort Estimation?
 - Find schedule?
 - Find minimum size of the team you would require to develop this system?



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- Assuming that your client would pay Rs. 50,000 per month of development, how much would be the likely billing?

Tutorial-4:

Function Point: <http://conferences.embarcadero.com/article/32094#Bonus> .

Analyze the case study and **identify** the error and **solve** it. At the end, need to **assess** calculation part of effort using FP oriented estimation model.

Tutorial-5

Consider the following Java code segment:

```
public Hashtable countAlphabet(String aString){
    Hashtable table = new Hashtable();
    If(aString.length > 4000) return table;
    StringBuffer buffer = new StringBuffer(aString);
    while (buffer.length() > 0){
        String firstChar = buffer.substring(0, 1);
        Integer count = (Integer)table.get(firstChar);
        if (count == null){
            count = new Integer(1);
        } else{
            count = new Integer(count.intValue() + 1);
        }
        table.put(firstChar, count);
        buffer.delete(0, 1);
    }
    return table;
}
```

1. Guarantees that all independent execution path is exercised at least once;
2. Guarantees that both the true and false side of all logical decisions are exercised;
3. Executes the loop at the boundary values and within the boundaries.

Sketch out Design control flow diagram and **Apply** Cyclomatic complexity for given Code. **Identify** numbers of Independence path require for testing.

Tutorial 6:-

Subject Project: For below mentioned Systems and other systems assign a mini-project two a group of students to prepare Software documents mentioned as A to E

1. Library Information System
2. Villager Telephone System
3. Waste Management Inspection Tracking System (WMITS)
4. Flight Control System



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5. Ambulance Dispatching System
 - A. Development of Software Requirements Specification (SRS)
 - B. Function oriented design using SA/SD
 - C. Object-oriented design using UML
 - D. Test case design
 - E. Implementation using Java and testing

Tutorial 7:

Study of any any two Open source tools in DevOps for Infrastructure Automation, Configuration Management ,Deployment Automation, Performance Management, Log Management. Monitoring. (Behat , Watir, Chef, Supergiant, SaltStack, Docker, Hudson etc)

Design based Problems (DP)/Open Ended Problem:

- Assume that you are Software Architect or Project Manager in organization. You have been assigned the task of constructing a website for a specific company with your team. Design and priorities the test cases using test case templates for this project.
- For Natural Language Processing (NLP) applications, estimate project failure rate.
- Design and develop an open source method of detecting the DIFFERENCESS between two Engineering designs for the same problem.

List of Open Source Software/learning website:

- www.en.wikipedia.org/wiki/Software_engineering
- www.win.tue.nl
- www.rspa.com/spi
- www.onesmartclick.com/engsineering/software-engineering.html
- www.sei.cmu.edu
- <https://www.edx.org/school/uc-berkeleyx>
- <https://devops.com/most-popular-open-source-devops-tools/>
- <https://www.guru99.com/devops-tutorial.html>

Various Web Based SE Tools

- Software:-Rational Rose, Microsoft Visio, Enterprise resource planning
- Project Management Tools
- SCM Tools
- SQA Tools
- Analysis and Design Tools
- User Interface Development Tools
- Object-Oriented Software Engineering Tools
- Testing Tools



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3150711

GTUQuestionPapers.com



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3161606

Semester – VI

Subject Name: Cryptography and Network security

Type of course: core

Prerequisite: Mathematical concepts: Random numbers, Number theory, finite fields

Rationale: The use of the Internet for various purpose including social, business, communication and other day to day activities has been in common place. The information exchanged through Internet plays vital role for their owners and the security of such information/data is of prime importance. Knowing the concepts, principles and mechanisms for providing security to the information/data is very important for the students of Computer Engineering/Information technology. The subject covers various important topics concern to information security like symmetric and asymmetric cryptography, hashing, message and user authentication, digital signatures, key distribution and overview of the malware technologies. The subject also covers the applications of all of these in real life applications.

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	Introduction – Security services, security services, security mechanisms Finite fields – group, ring, fields, modular arithmetic, The Euclidean algorithm.	5	15%
1	Symmetric Cipher Model, Cryptography, Cryptanalysis and Attacks; Substitution and Transposition techniques	3	5%
2	Stream ciphers and block ciphers, Block Cipher structure, Data Encryption standard (DES) with example, strength of DES, Design principles of block cipher, AES with structure, its transformation functions, key expansion, example and implementation	5	10%
3	Multiple encryption and triple DES, Electronic Code Book, Cipher Block Chaining Mode, Cipher Feedback mode, Output Feedback mode, Counter mode	4	5%



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering Subject Code: 3161609

4	Public Key Cryptosystems with Applications, Requirements and Cryptanalysis, RSA algorithm, its computational aspects and security, Diffie-Hillman Key Exchange algorithm, Man-in-Middle attack	7	15%
5	Cryptographic Hash Functions, their applications, Simple hash functions, its requirements and security, Hash functions based on Cipher Block Chaining, Secure Hash Algorithm (SHA)	4	10%
6	Message Authentication Codes, its requirements and security, MACs based on Hash Functions, Macs based on Block Ciphers	3	10%
7	Digital Signature, its properties, requirements and security, various digital signature schemes (Elgamal and Schnorr), NIST digital Signature algorithm	4	8%
8	Key management and distribution, symmetric key distribution using symmetric and asymmetric encryptions, distribution of public keys, X.509 certificates, Public key infrastructure	4	7%
9	Remote user authentication with symmetric and asymmetric encryption, Kerberos	4	5%
10	Web Security threats and approaches, SSL architecture and protocol, Transport layer security, HTTPS and SSH	5	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	Define terms related to cryptography, hashing, message authentication code, digital signature.	20
CO-2	Describe and discuss symmetric key cryptography algorithms, public key cryptography algorithms, hashing algorithms, Message authentication code generation algorithms, digital signature algorithms, key generation and key management, issues in web security and solution, issues in Transport layer security and solution.	30
CO-3	Demonstrate the generation of keys and execution of symmetric and public key algorithms from given data.	40
CO-4	Implement cryptography solution for given security problem by identifying strength and weaknesses of algorithms based on	10



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3161609

	cryptanalytic and brute force attack.	
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Books

1. Cryptography And Network Security, Principles And Practice Sixth Edition, William Stallings, Pearson
2. Information Security Principles and Practice By Mark Stamp, Wiley India Edition
3. Cryptography & Network Security, Forouzan, Mukhopadhyay, McGrawHill
4. Cryptography and Network Security Atul Kahate, TMH
5. Cryptography and Security, C K Shyamala, N Harini, T R Padmanabhan, Wiley-India
6. Information Systems Security, Godbole, Wiley-India
7. Information Security Principles and Practice, Deven Shah, Wiley-India
8. Security in Computing by Pfleeger and Pfleeger, PHI
9. Build Your Own Security Lab : A Field Guide for network testing, Michael Gregg, Wiley India

List of opensource software/website:

<https://www.wireshark.org/>



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Subject Code:

List of Practical:

1.	<p>Implement RSA algorithm.</p> <p>Take two prime numbers p,q</p> $n=pxq$ <p>Initially take encryption key such that it is relatively prime with $\phi(n)$.</p> <p>Find out decryption key.</p> <p>Take plaintext message M, Ciphertext $C=M^e \text{ mod } n$.</p> <p>To get plaintext from ciphertext $M=C^d \text{ mod } n$.</p> <p>Test case :</p> <p>Two prime numbers 17,11</p> <p>Encryption key = 7</p> <p>Decryption key = 23</p> <p>M=88</p> <p>C=11</p>
2.	<p>Implement playfair cipher. The plaintext is paired in two characters. Discuss the advantage of polyalphabetic cipher over monoalphabetic cipher.</p> <p>Key = MONARCHY</p> <p>Plaintext = ar mu hs ea</p> <p>Ciphertext = RM CM BP IM</p>
3.	<p>Implement Ceasar and Hill cipher. Both are substitution cipher. Analyze the strength of the cipher in terms of brute force attack and cryptanalysis attack. Suggest one way to improve and strengthen the cipher and analyze with respect to cryptanalysis attack.</p> <p>Ceasar cipher -</p> <p>You are given plaintext Hello, Welcome. The key used is 3. How Ceasar cipher will work?</p> <p>Test case :</p>



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	<p>A B C</p> <p>D E F</p> <p>Hill Cipher -</p> $\text{Key K} = \begin{bmatrix} 17 & 17 & 5 \\ 21 & 18 & 21 \\ 2 & 2 & 19 \end{bmatrix}$ <p>Plaintext = pay</p> <p>Ciphertext = RRL</p>
5.	<p>Implement Euclid algorithm to find GCD.</p> <p>$\text{GCD}(16,12) = 4$</p> <p>$\text{GCD}(12,4) = 0$</p> <p>Then 4 is the GCD(16,12)</p>
6.	<p>Generate random number of 32 bits. Use different random number generation algorithms. Which method gives the best ?</p> <p>Random number must pass 3 tests</p> <ol style="list-style-type: none">1. Uniformity2. Scalability3. Consistency <p>First method Linear congruential generator</p> $X_{n+1} = (aX_n + c) \text{ mod } m$ <p>m,a,c,X₀ are integers.</p> <p>Second method : Blum Blum shub generator</p>



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7.	Implement Euler's totient function $\phi(n)$. It is defined as the number of positive integers less than n and relatively prime to n. Find $\phi(35)$ and $\phi(37)$. Observe the value and analyze the behavior of totient function.
8.	Write a program that creates a shortcut of a file.(Virus program)
9.	Write a program that increases file size by 10.
10.	Implement rail Fence and transposition cipher. Both are permutation cipher. Analyze the strength of the cipher in terms of cryptanalysis. Rail fence. Test case : Meetme Ciphertext : MEMETE Transposition Key : 4312567 Plaintext: attackpostponeduntiltwoam Ciphertext: TTNAAPTMTSUOAODWCOIXKNLYPETZ
11.	Read traffic going on network. Analyze the traffic. Connect to internet and Read what is going on internet. Hint : Use Wireshark



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3161607

BIG DATA ANALYTICS

B.E. 6th Semester

Type of course: Elective

Prerequisite: Programming skills

Rationale: Today's world is a data-driven world. Increasingly, the efficient operation of organizations across sectors relies on the effective use of vast amounts of data. Big data analytics helps us to examine these data to uncover hidden patterns, correlations, and other insights. It is a fast-growing field and skills in the area are some of the most in-demand today.

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

Syllabus:

Sr. No.	Content	Total Hrs	% Weightage
1	Introduction to Big Data: Introduction to Big Data, Big Data characteristics, Challenges of Conventional System, Types of Big Data, Intelligent data analysis, Traditional vs. Big Data business approach, Case Study of Big Data Solutions.	04	8%
2	Hadoop: History of Hadoop, Hadoop Distributed File System: Physical organization of Compute Nodes, Components of Hadoop Analyzing the Data with Hadoop, Scaling Out, Hadoop Streaming, Design of HDFS, Java interfaces to HDFS Basics, Developing a Map Reduce Application, How Map Reduce Works, Anatomy of a Map Reduce Job run, Failures, Job Scheduling, Shuffle and Sort, Task execution, Map Reduce Types and Formats, Map Reduce Features, Hadoop environment. Setting up a Hadoop Cluster, Cluster specification, Cluster Setup and Installation, Hadoop Configuration, security in Hadoop, Administering Hadoop, Monitoring-Maintenance, Hadoop benchmarks, Hadoop in the cloud	12	25%
3	NoSQL: What is NoSQL? NoSQL business drivers; NoSQL case studies; NoSQL data architecture patterns: Key-value stores, Graph stores, Column family (Bigtable) stores, Document stores, Variations of NoSQL architectural patterns; Using NoSQL to manage big data: What is a big data NoSQL solution? Understanding the types of big data problems; Analyzing big data with a shared-nothing architecture; Choosing distribution models: master-slave versus peer-to-peer; Four ways that NoSQL systems handle big data problems	07	15%
4	Mining Data Stream: Introduction to Streams Concepts, Stream Data Model and Architecture, Stream Computing, Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Estimating moments, Counting oneness in a Window, Decaying Window, Real time Analytics Platform (RTAP) applications, Case Studies, Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics	10	21%



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3161607

5	Frameworks: Applications on Big Data Using Pig and Hive, Data processing operators in Pig, Hive services, HiveQL, Querying Data in Hive, fundamentals of HBase and ZooKeeper, IBM InfoSphere BigInsights and Streams.	08	16%
6	Spark: Introduction to Data Analysis with Spark, In-Memory Computing with Spark, Spark Basics, Interactive Spark with PySpark, Writing Spark Applications	07	15%

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
15	15	30	20	15	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) Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007
- 2) Bill Franks, "Taming The Big Data Tidal Wave: Finding Opportunities In Huge Data Streams With Advanced Analytics", Wiley
- 3) Anand Rajaraman and Jeff Ullman "Mining of Massive Datasets", Cambridge University Press,
- 4) Michael Minelli, Michele Chambers, Ambiga Dhiraj, "Big Data Big Analytics: Emerging Business Intelligence And Analytic Trends For Today's Businesses", Wiley India
- 5) Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley.
- 6) Chris Eaton, Dirk derooset al., "Understanding Big data", McGraw Hill, 2012.
- 7) BIG Data and Analytics, Seema Acharya, Subhashini Chhellappan, Willey
- 8) MongoDB in Action, Kyle Banker, Piter Bakkum, Shaun Verch, Dream tech Press
- 9) Tom White, "HADOOP: The Definitive Guide", O Reilly 2012.
- 10) Vignesh Prajapati, "Big Data Analytics with R and Hadoop", Packet Publishing 2013.
- 11) Learning Spark: Lightning-Fast Big Data Analysis Paperback by Holden Karau

Course Outcome:

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

Sr. No.	CO Statement	Marks % Weightage
1	identify big data application areas	15%
2	use big data framework	30%
3	model and analyze data by applying selected techniques	25%
4	demonstrate an integrated approach to big data	30%



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3161607

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

Case Study:

Stage 1:

Selection of case study topics and formation of small working groups of 2/3 students per group. Students engage with the cases, read through background material provided in the session and work through an initial set of questions to deepen the understanding of the case. Sample applications and data will be provided to help students familiarize themselves with the cases and available (big) data.

Stage 2:

The groups are given a specific task relevant to the case in question and are expected to develop a corresponding big data concept using the knowledge gained in the course and the parameters set by the case study scenario. A set of questions that help guide through the scenarios will be provided.

Stage 3:

Each group prepares a short 2 – 5 page report on their results and a 10 min oral presentation of their big data concept.

Apart from case student students will perform at the following programming exercises:

1. Implement following using Map- Reduce
 - a. Matrix multiplication
 - b. Sorting
 - c. Indexing
2. Distributed Cache & Map Side Join, Reduce side Join Building and Running a Spark Application Word count in Hadoop and Spark Manipulating RDD
3. Implementation of Matrix algorithms in Spark Sql programming
4. Implementing K-Means Clustering algorithm using Map-Reduce
5. Implementing any one Frequent Item set algorithm using Map-Reduce
6. Create A Data Pipeline Based On Messaging Using PySpark And Hive - Covid-19 Analysis

List of Open Source Software/learning website:

1. <http://in.reuters.com/tools/rss>
2. <http://www.altova.com/xmlspy.html>
3. <https://www.w3.org/RDF/>



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: 3161609

Semester – VI

Subject Name: Enterprise application development

Type of course: Elective

Prerequisite: Java Programming

Rationale: To develop server side Java application The Java platform Enterprise Edition (Java EE) is used which consists of set of application programming interface.

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	Marks Weight age (%)
1	Introduction to Java EE Java EE APIs	01	00
2	Java Server Faces Introducing JSF, Developing first JSF application, Custom Data Validation, Customizing JSF's default messages, JSF HTML5 support, JSF 2.2 Faces flows	04	20
3	Object relation mapping with Java Persistent API The customer database, The Java Persistent API	03	05
4	Enterprise JavaBeans Session beans, Asynchronous method calls, Message Driven beans, Transactions in enterprise JavaBeans, Enterprise JavaBean life cycles, EJB timer service,	05	20
5	Contexts and Dependency Injection Named beans Dependency injection Qualifiers	05	5



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	Named bean scopes CDI events		
6	JSON processing with JSON-P and JSON-B The JSON-P model API, The JSON – P streaming API, JSON pointer, JSON patch Populating Java Objects from JSON with JSON-B Generating JSON strings from Java objects with JSON-B	05	10
7	WebSocket Developing a WebSocket server endpoint Developing WebSocket clients Java Messaging Service Message queue, Message Topics	03	10
8	Restful Web Services with JAX-RS Introduction, Developing a simple RESTful web service, Developing a RESTful web service client, Query and path parameters, Server sent events Microservices development with Java EE Introduction to microservices, Microservices and Java EE, Developing Microservices with Java EE Web services with JAX-WS Developing web services with JAX-WS, Exposing EJBs as web services	08	15
9	Servlet Development and Deployment Introduction, Request forwarding and response redirection, persisting application data across requests, passing initialization parameter, Servlet filters, Servlet listeners, Pluggability, Configuring web applications, asynchronous processing,	08	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	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 %
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		weightage
CO-1	Write applications with JSF, Beans with context and dependency	50
CO-2	Use of WebSocket and Java Messaging Service	25
CO-3	Write server side web application using Servlet	15
CO-4	Develop Micro services and Restful Web Services	10

Books

- 1) Java EE 8 Application Development by David Heffelfinger, Packt
- 2) Java EE and HTML 5 Enterprise application development by John brock, Arun Gupta, Geertjan wpelenga McGrawhill Oracle
- 3) Black Book “ Java server programming” J2EE, 1st ed., Dream Tech Publishers, 2008. 3. Kathy walrath ”
- 4) Complete Reference J2EE by James Keogh mcgraw publication
- 5) Professional Java Server Programming by Subrahmanyam Allamaraju, Cedric Buest Wiley Publication
- 6) Core Java, Volume II: Advanced Features by Cay Horstmann and Gary Cornell Pearson Publication
- 7) Java Persistence with Hibernate by Christian Bauer, Gavin King
- 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 and Tomcat, Giulio Zambon, Apress
- 12) JSF2.0 CookBook, Anghel Leonard, PACKT publication

List of Open Source Software/learning website:

1. <https://www.tutorialspoint.com/>
2. <https://www.geeksforgeeks.org/introduction-java-servlets/>

List of Practical:

1. Write an application for transferring files using WebSocket.
2. Implement the shopping cart for users for the online shopping. Apply the concept of session.
3. Implement student registration form with enrollment number, first name, last name, semester, contact number. Implement with Java Beans
4. Write a Servlet program to print system date and time.
5. Design a web page that takes the Username from user and if it is a valid username prints “Welcome Username”. Use JSF to implement.
6. Develop a Restful web service for user management with username and profession.



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3161610

DATA WAREHOUSING AND DATA MINING

B.E. 6th SEMESTER

Type of course: Under graduate (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	Data Warehousing: OLAP & OLTP, Data warehouse & Data mart, OLAM architecture, Extraction, Transform & Loading (ETL) concept for generic, two-tier, three-tier architecture, Data warehousing schema - Star, Snowflake, Fact Constellation (Galaxy) - Data Cube, Operations on Data cube (slicing, roll up, roll down, drill up etc)	5	10
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	Mining Frequent Patterns, Associations and Correlations: 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.	7	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:	10	20



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Subject Code: 3161610

	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 Hierarchical Clustering, Strengths and Weakness; Outlier Detection, Clustering high dimensional data, clustering Graph and Network data.		
8	Advance topics: Introduction to Web Mining, Spatial Data Mining, Temporal Mining, Text Mining and Multimedia Mining.	3	10

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. Ning Tan, Vipin Kumar, Michael Steinbach Pang, "Introduction to Data Mining", Pearson Education

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

1. Understand why the data warehousing is important in addition to database systems.
2. Perform the preprocessing of data and apply mining techniques on it.
3. Identify the association rules, classification and clusters in large data sets.
4. Solve real world problems in business and scientific information using data mining.
5. Use data analysis tools for scientific applications.
6. Implement various supervised machine learning algorithms.

List of Experiments:

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



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Bachelor of Engineering

Subject Code: 3161611

ADVANCED WEB PROGRAMMING

6th SEMESTER

Type of course: NA

Prerequisite: Basic knowledge of Internet and Client Server system is required, Java Script, Dynamic Web Programming

Rationale: Today's world is driven by Internet based applications. The rationale behind this course is to impart the knowledge of java script based framework for web programming among students of Information Technology. Students will learn advanced web programming concepts related to Java script, Angular JS, Node JS and MongoDB.

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.	Contents	Total Hrs	% Weight
1	Refreshing Java Script and CSS CSS syntax, benefits, Responsive design, Bootstrap introduction, Java script syntax, Java script inbuilt objects, Error handling and event handling, DOM, Asynchronous Programming	06	10%
2	Introduction to Angular JS Basics and Syntax of Angular JS, Features, Advantages, Application Structure, Basics of routes and navigation, MVC with Angular JS, Services	08	15%
3	Angular JS in Details Modules, Directives, Routes, Angular JS Forms and Validations, Data binding, Creating single page website using Angular JS	10	20%
4	Introduction to Node JS Setup Node JS Environment, Package Manager, Features, Console Object, Concept of Callbacks	08	15%
5	Node JS in details Events and Event Loop, timers, Error Handling, Buffers, Streams, Work with File System, Networking with Node (TCP, UDP and HTTP clients and servers), Web Module, Debugging, Node JS REST API, Sessions and Cookies, Design patterns, caching, scalability	12	20%
6	Database Programming with Node JS and MongoDB Basics of MongoDB, Data types, Connect Node JS with MongoDB, Operations on data (Insert, Find, Query, Sort, Delete, Update) using Node JS	10	20%



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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. Angularjs in Action ISBN 9789351198383 Ruebelke, Wiley Publication
2. Node.js in Action ISBN 9789386052049 Alex Young, Bradley Meck, Mike Cantelon, Tim Oxley, Marc Harter, T.J. Holowaychuk, Nathan Rajlich, Wiley Publication
3. Node.Js in Practice ISBN 9789351197744 Alex Young, Marc Harter, Ben Noordhuis Wiley Publication
4. Pro AngularJS Freeman Apress publication
5. Professional Node.js By Pedro Teixeira 9781118240564 Wiley Packt Publishing

Course Outcome:

1. Learn the concepts of client side programming using CSS and Java Script
2. Understand the concepts of Angular JS to extend basic HTML features
3. Learn Node JS framework to build dynamic server side applications
4. Study the concept of database using Mongo DB and connect database with application.
5. Design and implement full featured web application using the concepts of Angular JS and Node JS

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:

HTML:

<https://developer.mozilla.org/en-US/docs/Web/HTML>

<https://www.w3schools.com/html/>

<https://www.tutorialspoint.com/html/index.htm>

CSS:

<https://developer.mozilla.org/en-US/docs/Web/CSS>

<https://www.manning.com/books/css-in-depth>

<https://www.w3schools.com/css/>

<https://www.tutorialspoint.com/css/index.htm>

Java Script:

<https://javascript.info/>

<https://github.com/getify/You-Dont-Know-JS>



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<https://www.w3schools.com/js/>

<https://www.tutorialspoint.com/javascript/index.htm>

PHP:

<https://www.w3schools.com/php/>

<https://www.tutorialspoint.com/php/index.htm>

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Bachelor of Engineering

Subject Code: 3161612

Semester – VI

Subject Name: Mobile Application Development

Type of course: Elective

Prerequisite: NA

Rationale: There is a growing number of people who uses smartphones and tablets and hence **mobile app development** has ability to access a large segment. Android has an advantage of being open source. This course will enable the students to develop mobile application using Android.

Teaching and Examination Scheme:

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

Content:

Sr. No.	Content	Total Hrs	Marks Weight age (%)
1	Overview of Android Introducing Android, The Android Application Components, The manifest file, Downloading and Installing Android, Exploring the Development Environment, Developing and Executing the first Android Application.	03	10
2	Using Activities, Fragments and Intents in Android Working with activities, Using Intents, Fragments, Using the Intent Object to Invoke Built-in Application	03	20
3	Working with the User Interface Using Vies and ViewGroups Working with View Groups, Building data with the AdapterView Class, Designing AutoTextCompleteView, Implementing Screen Orientation, Designing the views programmatically, Handling UI events, Creating Menus	04	20
4	Storing the Data Persistently Introducing the Data Storage Options, Using the internal storage, Using the external storage, Using the SQLite Database, Working with content Provider	05	20
5	Working with Location Services and Maps Working with Google Maps, Working with Geocoding and Reverse Geocoding.	04	5



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6	Working with Graphics and Animation Working with Graphics, Using the Drawable Object, Using the ShapeDrawable object, Hardware Acceleration, Working with Animation	04	10
7	Audio, Video and Camera Use Media Player, Recording and Playing sound, Creating a sound pool, Using Camera, Recording Video	02	10
8	Publishing and Distributing Android Application Signing the Android Application, Versioning the Android Application, Publishing the Android Application	03	5

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	Understand Android architecture, activities and their life cycle.	10
CO-2	Use View Groups comprising layouts and Views in application.	40
CO-3	Manage data binding, user interface events, maps	25
CO-4	Work with graphics, animation, still images and video.	20
CO-5	Publish and distribute Android Application	05

Books

- 1) Android Application Development Black Book by Pradeep Kothari, DreamTech
- 2) Beginning Android 4 Application Development by Wei Meng Lee, Wrox
- 3) Android Wireless Application Development By Lauren Darcey, Shane Conder, Pearson

List of Open Source Software/learning website:

1. <https://developer.android.com/>

List of Practical:

1. Write an Android application for calculator
2. Write an Android application to convert into different currencies for example, Rupees to dollar
3. Write an android application to count library overdue.



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4. Write an android application to convert a ball from size of radius 2(colour red) to radius 4(colour blue) to radius 6 (colour green). The ball must rotate in circle for 1 minute before changing size and colour.
5. Write an application to mark the daily route of travel in map.
6. Write an application to record video and audio on topic "Intent" and play the audio and video.

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Subject Code: 3161613

Semester – VI

Subject Name: Data Analysis and Visualization

Type of course: Elective

Prerequisite: NA

Rationale: Data Analytics involves data discovery that helps in making smart decisions, creating suggestions for options based on previous choices. Data visualization sees the pattern in data and also sees the pattern when data is not part of pattern.

Teaching and Examination Scheme:

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

Content:

Sr. No.	Content	Total Hrs	Marks Weight age (%)
1	Math, probability and statistical modeling Exploring probability and inferential statistics, quantifying correlation, Reducing Data Dimensionality with linear algebra, Modeling Decisions with Multi Criteria Decision making, Regression Methods, Detecting outliers, Time-series analysis	05	20
2	Using Clustering to subdivide data Introducing clustering basics, identifying clusters, Categorizing data with Random forest algorithm	03	15
3	Modeling instances Recognizing the Difference between Clustering and Classification, Making sense of data with nearest neighbor analysis, classifying data with average nearest neighbor algorithms, classifying data with K- nearest neighbor algorithms, Solving Real-world problems	06	15
4	Principles of Data Visualization Design Data visualization: The big three, Designing to meet the needs, Picking the most appropriate Design style, Choosing how to add context, Selecting the appropriate Data Graphic Type, Choosing a Data Graphic, Using D3.js for Data Visualization.	05	20
5	Web based applications for visualization design, Exploring best practices in Dashboard Design, Making maps from spatial data	06	20



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6	Data science for driving growth in E-commerce	03	10
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Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
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	Perform descriptive statistics and dimensionality reduction.	20
CO-2	Perform clustering and detect outliers	30
CO-3	Perform data visualization	40
CO-4	Apply the analytics and visualization to real world problems.	10

Books

- 1) Data science for Dummies by Lillian Pierson WILEY publication
- 2) Doing Data Science by Cathy O'Neil, Rachel Schutt, O'Reilly Media, Inc.
- 3) **Data Analytics for Beginners: Basic Guide to Master Data Analytics Paperback –by Paul Kinley**

List of Open Source Software/learning website:

- 1) <https://www.analyticsvidhya.com/>

List of Practical:

1. Prepare synthetic data set for student data, consisting of Enrollment number, name, gender, semester wise, subject wise marks, difficulty level of the subject, SPI(Semester Index), address with geographical location.
 - a.
 - (i) Write a program to find correlation between gender and Semester marks.
 - (ii) Write a program to find correlation between geographical location and semester marks. Analyze which two are highly correlated.
 - b. Write a program to calculate correlation between difficulty level and subject marks. The higher the difficulty level the marks should be less. The two should be negatively correlated. Analyze the correlation.



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2. Consider the sample of 50 students. Gather the university exam score of the students across all semesters of Engineering for one college. Write a program to find out mean and standard deviation for this college. Now consider the sample of students of different colleges of Gujarat for university exam score. Write a program to find out mean and standard deviation. Write the observations.
3. Collect the month wise COVID cases data for cities – Ahmedabad, Vadodara, Rajkot, Surat. Plot this time series Data. Analyze the trend as per time.
4. There is a need to advice the 12th standard students that which college he/she should choose for engineering education. Decide the features to use for grading the engineering college. Prepare the data set. Write a program to apply random forest algorithm and suggest the best suited college for 12th standard students.
5. Consider the following data set.

Height (in cms)	Weight (in kgs)	The weightlifting category
158	58	M
158	59	M
158	63	M
160	59	M
160	60	M
163	60	M
163	61	M
160	64	L
163	64	L
165	61	L
165	62	L
165	65	L
168	62	L
168	63	L
168	66	L
170	63	L
170	64	L
170	68	L



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Write a program for KNN algorithm to find out weight lifting category for height 161cm and weight 61kg.

6. Take the data of the students prepared in exercise 1. Visualize the data to show region wise results, branch wise results, subject wise results. Decide the visualization technique to show appropriate data.
bar chart, pie chart, maps, scatter plot
7. Use D3.js to show following.
 - (i) Take year wise population.
 - (ii) Show appropriate size circle for population as per year.
 - (iii) Fill color in circle.
 - (iv) Prepare bar chart and pie chart.
 - (v) Explore other functionality of D3.js

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