



# GUJARAT TECHNOLOGICAL UNIVERSITY

**Bachelor of Engineering**

**Subject code: 3150004**

**Subject Name: Contributor Personality Development Program**

**Semester V**

**Type of course:** Work-Personality Development

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

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

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

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

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

**Teaching and Examination Scheme per semester:**

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

Note:

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



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

### Note:

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

### Content:

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



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

### Suggested Specification table with Marks (Theory):

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

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

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

### Reference resources:

A. Basic reference for both students and teachers

- Contributor Personality Program textbook cum workbook developed by Illumine



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

### B. Advanced reference for teachers

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

### Course Outcomes:

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



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



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**Bachelor of Engineering**

**Subject Code: 3150005**

**Semester – V**

**Subject Name: INTEGRATED PERSONALITY DEVELOPMENT COURSE**

## **Type of Course –**

Value-based holistic personality development course for university students.

## **Rationale -**

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

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

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

## **Teaching and Examination Scheme:**

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

## **Content:**

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



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

<b>Module No.</b>	<b>Module/ Course Topics</b>	<b>Lectures</b>	<b>References</b>
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1	Facing Failures	Factors Affecting Failures Failures are not Always Bad Insignificance of Failures Power of Faith Practicing Faith	<ol style="list-style-type: none"><li>1. Thomas Edison's factory burns down, New York Times Archives, Page 1, 10/12/1914</li><li>2. Lincoln Financial Foundation, Abraham Lincoln's "Failures": Critiques, Forgotten Books, 2017</li><li>3. J.K. Rowling Harvard Commencement Speech   Harvard University Commencement, 2008</li><li>4. Born Again on the Mountain: A Story of Losing Everything and Finding It Back, Arunima Sinha, Penguin, 2014</li><li>5. Failing Forward: Turning Mistakes Into Stepping Stones for Success, John C. Maxwell, Thomas Nelson, 2007</li><li>6. Steve Jobs: The Exclusive Biography Paperback, Walter Isaacson, Abacus, 2015</li></ol>
2	Learning from Legends	Tendulkar & Tata Leading Without Leading	<ol style="list-style-type: none"><li>1. Chase Your Dreams: My Autobiography, Sachin Tendulkar, Hachette India, 2017</li><li>2. Playing It My Way: My Autobiography, Sachin Tendulkar, Hodder &amp; Stoughton, 2014</li><li>3. The Wit and Wisdom of Ratan Tata, Ratan Tata, Hay House, 2018</li><li>4. The Tata Group: From Torchbearers to Trailblazers, Shashank Shah, Penguin Portfolio, 2018</li><li>5. The Leader Who Had No Title, Robin Sharma, Jaico Publishing House, 2010</li><li>6. In the Joy of Others: A Life Sketch of Pramukh Swami Maharaj, Mohanlal Patel and BAPS Sadhus, Swaminarayan Aksharpath, 2013</li></ol>
3	Mass Management	Project Management	<ol style="list-style-type: none"><li>1. Project Management Absolute Beginner's Guide, Gregory Horine, Que Publishing, 2017</li><li>2. The Fast Forward MBA in Project Management, Eric Verzuh, Wiley, 2011</li><li>3. Guide to Project Management: Getting it right and achieving lasting benefit, Paul Roberts, Wiley, 2013</li></ol>





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



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8	Soft Skills	Teamwork & Harmony Networking - Decision Making - Leadership	<ol style="list-style-type: none"><li>1. The 17 Indisputable Laws of Teamwork, John Maxwell, HarperCollins, 2013</li><li>2. Team of Teams: New Rules of Engagement for a Complex World, Stanley McChrystal, Portfolio, 2015</li><li>3. Predictably Irrational, Revised and Expanded Edition: The Hidden Forces That Shape Our Decisions, Harper Perennial, Dan Ariely, 2010</li></ol>
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: 3150709

**SUBJECT NAME: Professional Ethics**

**Semester V**

**Type of course: NA**

**Prerequisite: NA**

**Rationale:**

**Teaching and Examination Scheme:**

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

**Content:**

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



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Subject Code: 3150709

Suggested Specification table with Marks (Theory):

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

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

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

### Reference Books:

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

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

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



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Bachelor of Engineering  
Subject Code: 3150910

Semester –V  
Subject Name: Electrical Machine- II

Type of course: Professional Core Course

Prerequisite: NA

**Rationale:** Electrical power sector is the backbone of industries, agriculture, irrigation, urban development and almost all the segments of society. In view of this, the rotating electrical equipments play a vital role for the society. This subject deals with the theory and performance analysis of various electrical machines.

**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
1	<b>Induction Machines:</b> Revision of the concept of rotating magnetic field. Construction, working and types of induction motor (squirrel cage and slip-ring), Torque Slip Characteristics, Starting and Maximum Torque. No-load & blocked rotor test, Equivalent circuit. Phasor Diagram, Losses and Efficiency. Effect of parameter variation on torque speed characteristics (variation of rotor and stator resistances, stator voltage, frequency). Methods of starting, braking and speed control for induction motors. Induction generator operation. Self-excitation of induction generator. Double cage induction motor. Circle diagram of induction motor. Effect of harmonics, Cogging & Crawling, Effect of unbalanced voltages on performance of motor.	16
2	<b>Single-phase induction motors:</b> Constructional features double revolving field theory, equivalent circuit, Determination of parameters. Split-phase starting methods and applications. Universal motor. Repulsion motor. Shaded pole single phase motor.	08
3	<b>Synchronous machines:</b> Constructional features, cylindrical rotor synchronous machine - generated EMF, equivalent circuit and phasor diagram, armature reaction, synchronous impedance, voltage regulation. Methods to find voltage regulation: Synchronous impedance method, MMF method, ZPF method. Operating characteristics of synchronous machines, Salient pole machine – two reaction theory, power angle characteristics. Parallel operation of alternators - synchronization and load division.	16



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4	<b>Synchronous motors:</b> Methods of starting of synchronous motors, Different torques in Synchronous motor, Stability, Synchronous condenser, Synchronous phase modifiers, V-curves of Synchronous motors, <b>Auto Synchronous Motor:</b> Construction, principle of operation, equivalent excitation current for various rotor connections, circle diagram.	08
5	<b>Special machines:</b> Magnetic levitation principle, advantages and applications of linear induction motor. Introduction to axial flux machines. Construction, working and applications of Permanent magnet brushless DC motor, Stepper motor and Switched reluctance motor.	08

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	20	20	20	20	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. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.
2. I J Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.
3. J B Gupta, "Theory and Performance of Electrical Machines", Katson Publication, 2009.
4. B L Theraja, "Electrical Technology – Part II", S Chand Publications, 2011
5. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
6. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
7. G C Garg, "Electrical machines – II", Khanna Publishers,
8. S K Sen, "Principle of Electrical Machine Design with Computer Programs" Oxford & IBH

### Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Describe the construction, working principle and applications of induction machines and synchronous machines	30



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CO-2	Analyze the performance of rotating electrical machines using the tools like equivalent circuit, phasor diagram and circle diagram	30
CO-3	Evaluate the performance parameters of rotating machines with different operating conditions	30
CO-4	Illustrate the construction, working, applications and advantages of special machines	10

### List of Experiments:

- To perform no load and blocked rotor test on three phase induction motor to obtain the parameters of equivalent circuit
- To perform no load and blocked rotor test on three phase induction motor to evaluate the performance parameters using circle diagram
- To perform no load and blocked rotor test on single phase induction motor to obtain the parameters of equivalent circuit
- To obtain the performance parameters of three phase induction motor using direct load test.
- To find out the voltage regulation of three phase alternator using direct load test
- To perform open circuit, short circuit and resistance measurement tests on alternator to find out its voltage regulation using synchronous impedance method and MMF method.
- To perform open circuit, short circuit, zero power factor and resistance measurement tests on alternator to find out its voltage regulation using ZPF method.
- To perform synchronization of alternator using dark lamp method, two bright one dark lamp method and synchroscope.
- To obtain direct axis and quadrature axis reactance of salient pole synchronous machine using slip test.
- To obtain the v-curves of a synchronous motor.
- To study the construction and working of special electric machines like stepper motor, permanent brushless DC motor and switched reluctance motor.

### Major Equipments:

Required number of machines, panels, meters, accessories and instruments etc... to be provided to conduct the above experiments in a group of maximum 4 students. Charts and cut section models of various machines should be provided for better understanding.

### List of Open Source Software/learning website:

- <http://www.scilab.org/>
- <http://www.gnu.org/software/octave/>
- <http://www.vlab.co.in>
- <http://www.femm.info>





# GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3150911

## Subject Name: Power System II Semester V

**Type of course:** Engineering – Professional Core Course

**Prerequisite:** Fundamental knowledge of Electrical Engineering and Power System – I

**Rationale:** The course is aimed to provide exposure about the modeling of power systems components and transmission line, its analysis and performance including the fault analysis of power systems, brief introduction to corona and transients in power system.

### 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.	<b>Basic Principles:</b> Power in single phase AC circuits, Complex power, Complex power balance, Complex power flow, Balanced Three Phase Circuits, Star connected loads, Delta connected loads, Delta-star transformation, Per phase analysis, Balanced three phase power.	04	05
2.	<b>Representation of Power System Components:</b> One line and impedance diagram, Per unit system, Per unit representation of transformer, Per unit impedance diagram of power system, Examples – per unit system and impedance diagram, Synchronous machine, Power factor and power control, Salient pole synchronous generator, Operating chart of a synchronous generator, Representation of loads.	08	10
3.	<b>Transmission Line Modeling and Performance:</b> Introduction, Short transmission line, Medium transmission line, Long transmission line – Rigorous solution, Evaluation of ABCD constants, Interpretation of long line equations, Ferranti effect, Tuned power lines, Power through a transmission line, Circle diagrams, Methods of voltage control, Examples.	14	25
4.	<b>Symmetrical Fault Analysis:</b> Introduction, Transient on a transmission line, Short circuit of a synchronous machine on no load, short circuit of a loaded synchronous machine, Selection of circuit breakers, Examples, $Z_{BUS}$ formulation – by inverting $Y_{BUS}$ , current injection technique, $Z_{BUS}$ building algorithm (Type – 1, 2, 3, 4 modifications).	08	10
5.	<b>Symmetrical Components:</b> Symmetrical component transformation, Phase shift in star-delta transformers, Sequence impedances of transmission lines, Sequence - impedances and networks of synchronous machines, Sequence impedances and networks of transformers, Construction of sequence networks of a power system, Examples.	07	15
6.	<b>Unsymmetrical Fault Analysis:</b> Introduction, Symmetrical component analysis of unsymmetrical faults,	07	15



## GUJARAT TECHNOLOGICAL UNIVERSITY

### Bachelor of Engineering

Subject Code: 3150911

	Single line to ground fault, Line to line fault, Double line to ground fault, Open conductor faults.		
7.	<b>Corona:</b> Critical Disruptive Voltage, Corona Loss, Line Design based on Corona, Disadvantages of Corona, Radio Interference, Inductive interference between Power and Communication lines, Examples.	04	05
8.	<b>Over-voltages in Power Systems:</b> Causes of over-voltages, Internal causes of over-voltages, Mechanism of lightning discharge, Types of lightning strokes, Harmful effects of lightning, Protection against lightning, Earthing screen, Overhead ground wires, Lightning arresters, Surge absorber, .	05	07
9.	<b>Transients in Power Systems:</b> Travelling waves on transmission lines, Open end line, Short circuited line, Line terminated through a resistance, Line connected to a cable, Reflection and refraction at a T-junction, Line terminated through a capacitance, capacitor connection at T, Attenuation of travelling waves. Capacitance switching, Over-voltages due to arcing ground.	07	08

#### Reference Books:

1. Modern Power system Analysis: I. J.Nagrath, D. P. Kothari, McGraw Hill Education
2. Power System Analysis: HadiSaadat, McGraw Hill Education India Pvt Ltd.
3. Electrical Power systems: C. L .Wadhwa, New Age International Publishers
4. Principles of Power System: V. K. Mehta, Rohit Mehta, S. Chand Publications
5. Power System Analysis and Design: J. Duncan Glover, Thomas J. Overbye, Mulukutla S. Sarma, Cengage Learning India Pvt. Ltd.
6. Elements of Power Systems Analysis: W. D. Stevenson Jr., McGraw Hill Education.
7. Power System Analysis : John J. Grainger, William D. Stevenson Jr., McGraw Hill Education

#### Suggested list of practical but not limited to:

1. To write computer program for plotting instantaneous voltage, current and power in a single phase ac circuit.
2. To write computer program and obtain voltage regulation and efficiency of short transmission line for different specified set of receiving end quantities (different load at leading, unity and lagging power factor).
3. To write computer program and obtain voltage regulation and efficiency of short transmission line for different specified set of sending end quantities (sending end leading, unity and lagging power factor).
4. To write computer program and obtain voltage regulation and efficiency of a Medium transmission line (using  $\pi$  model & T model) for different specified set of receiving end quantities (different load at leading, unity and lagging power factor).
5. To write computer program and obtain voltage regulation and efficiency of a Medium transmission line (using  $\pi$  model & T model) for different specified set of sending end quantities (sending end leading, unity and lagging power factor).
6. To write computer program to calculate voltage regulation and efficiency of a Long transmission line using distributed capacitance model for different specified set of receiving end quantities (different load at leading, unity and lagging power factor) and compare the results with results obtained with program for equivalent  $\pi$  model.
7. To write computer program to calculate voltage regulation and efficiency of a Long transmission line using distributed capacitance model for different specified set of sending end quantities (sending end leading, unity and lagging power factor) and compare the results with results obtained with program for equivalent  $\pi$  model.



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- To analyse the performance of long transmission line for specified load impedance.
- To obtain voltage profile and loadability curve for a transmission line.
- To compute shunt reactor compensation and performance of open circuited line.
- To compute shunt capacitor compensation and performance of loaded line.
- To compute series capacitor compensation and performance of loaded line.
- To develop program for formulation of  $Z_{BUS}$  matrix through  $Z_{BUS}$  building algorithm.
- To simulate transient in series R-L circuit with special attention to change in DC offset current for application of excitation at different instant.
- Dynamic simulation of three phase fault on terminal of unloaded synchronous generator. The simulation should show the waveforms of all three line current for fault at different instant on voltage wave of phase A.
- To develop program to transform three phase unbalanced phasor into its symmetrical components.
- To develop program to transform symmetrical components into its original phasors.
- To analyze line to line fault in power system (Using program/simulation).
- To analyze line to ground fault in power system (Using program/simulation).
- To analyze double line to ground fault in power system (Using program/simulation).
- To write a computer program for animation of travelling waves of a long transmission line with different operating conditions.

#### Suggested Specification table with marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	20	20	25	15	10

**Legends: R: Remembrance; U: Understanding, A: Application, N: Analyze, 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.

#### Course Outcome (Theory):

After learning the course the students should be able to:

Sr. No.	CO Statement	Marks % Weightage
1.	Prepare the model of transmission line, generator and transformer of power system for single line diagram representation and per unit quantity calculation.	15
2.	Evaluate performance of short, medium and long transmission lines.	25
3.	Analyze symmetrical and unsymmetrical faults in power system.	40
4.	Describe various aspects of over-voltages and corona in power transmission.	12
5.	Describe travelling wave and transients in power system.	08

#### Course Outcome (Laboratory):

After performing the practical, the students should be able to:

- Evaluate transmission line parameters and operating performance using computer program and simulation.
- Calculate fault current and voltages for three phase symmetrical and unsymmetrical faults on power systems using computer program and computer simulation.
- Calculate important Design parameters of transmission line design and calculate ratings of circuit breakers for transmission system.



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**Bachelor of Engineering**

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**Major software:**

MATLAB, C/C++, SciLab, PowerWorld Simulator

**List of Open Source Software/learning website:**

1. <https://www.scilab.org/>
2. <https://www.powerworld.com/download-purchase/demo-software/simulator-demo-download>
3. [https://swayam.gov.in/nd1\\_noc19\\_ee61/preview](https://swayam.gov.in/nd1_noc19_ee61/preview)
4. [https://swayam.gov.in/nd1\\_noc19\\_ee62/preview](https://swayam.gov.in/nd1_noc19_ee62/preview)
5. <http://vp-dei.vlabs.ac.in/Dreamweaver/list.html>

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# GUJARAT TECHNOLOGICAL UNIVERSITY

**Bachelor of Engineering**

**Subject Code: 3150912**

**Semester – V**

**Subject Name: Signals and Systems**

**Type of course: Engineering Science Course**

**Prerequisite:**

**Rationale:** Automation in industries and domestic level has made engineers to understand about various systems and signals. The interfacing of the machines with the different controllers specifically needs to calculate and estimate the basics about the signals and systems. Every domain expects engineers to be fundamentally clear about the signals and systems. This subject clears mainly the classification of the signals and systems with their various time and frequency domain analysis for future 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
1	<b>Introduction to Signals and Systems:</b> Signals and systems everyday life, biomedical, instrumentation domestic and industries. Representations of Signals, Classifications of Signals – Continuous time, Discrete time, comparison among Analog, Digital and Discrete Signals, Signal properties: periodicity, absolute integrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, and the complex exponential. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability. Examples.	06
2	<b>Mathematical operations on Signals and Systems:</b> Addition, subtraction, multiplication and division of the signals, parallel and series combinations of the systems, cascading of the systems, impulse response characterization and convolution integral for CT- LTI system, signal responses to CT- LTI system, properties of convolution, LTI system response properties from impulse response, Examples. Impulse response characterization and convolution sum, Causal signal response to DT-LTI systems. Properties of convolution summation, Impulse response of DT-LTI system. DT-LTI system properties from Impulse response. System analysis from difference equation model, examples.	10
3	<b>Fourier, Laplace and z-transforms:</b> Representation of periodic functions, Fourier series, Frequency spectrum of aperiodic	14



# GUJARAT TECHNOLOGICAL UNIVERSITY

**Bachelor of Engineering**

**Subject Code: 3150912**

	signals, Fourier Transform, Relation between Laplace Transform and Fourier Transform and its properties. Parseval's Theorem. Review of the Laplace Transform for continuous time signals and systems, system functions, poles and zeros of system functions and signals, Laplace domain analysis, solution to differential equations and system behavior. The z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, z-domain analysis.	
<b>4</b>	<b>Sampling &amp; reconstruction:</b> The Sampling Theorem and its implications. Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold. Aliasing and its effects. Relation between continuous and discrete time systems. Introduction to the applications of signal and system theory: modulation for communication, filtering, feedback control systems.	<b>05</b>
<b>5</b>	<b>Applications based on IoT:</b> Introduction of the Internet of Things, Types of sensors, Types of actuators, Introduction of Arduino Interfacing of the sensors and actuators with Arduino. Programming in Arduino. Signals storage and its analysis using Arduino, Design of a minor project based on Arduino.	<b>05</b>

**Suggested Specification table with Marks (Theory): (For PDDC only)**

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
<b>30</b>	<b>20</b>	<b>30</b>	<b>10</b>	<b>5</b>	<b>5</b>

**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. Signals and Systems by Alan V. Oppenheim, Alan S. Wilsky and Nawab, Prentice Hall
2. Signals and Systems by K. Gopalan, Cengage Learning (India Edition)
3. Signals and Systems by Michal J. Roberts and Govind Sharma, Tata Mc-Graw Hill Publications
4. Signals and Systems by Simon Haykin and Bary Van Veen, Wiley- India Publications
5. Linear Systems and Signals by B.P.Lathi, Oxford University Press
6. Signal, Systems and Transforms by Charles L. Philips, J. M. Parr and E. A. Riskin, Pearson Education
7. Signal and Systems by Anand Kumar, 3rd Edition, PHI
8. Internet of Things: Technologies, Applications, Challenges and Solutions by B. K. Tripathy & J. Anuradha, CRC Press, 2017.



# GUJARAT TECHNOLOGICAL UNIVERSITY

**Bachelor of Engineering**

**Subject Code: 3150912**

## Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Describe the type of system and signal in Industries and Domestic level for Interfacing.	40
CO-2	Derive mathematical model of the systems and signals for the applications.	30
CO-3	Analyze the response of system for the efficient usage of the systems.	15
CO-4	Design of the system from the available input signals and expected output signals of the industrial model.	15

## List of Experiments:

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

## Design based Problems (DP)/Open Ended Problem:

1. Design of active noise removal / cancellation circuit.
2. Design of digital building blocks to perform various operations on discrete time sequences and signals.
3. Design of efficient and accurate signal converter.
4. Design of sample and hold circuits
5. Design of a system for the Industrial applications from the input and out put signals.

## Major Equipments:





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Analog & Digital signal generator kits, CRO, DSO, Mathematical operations kit using OPAMP, sensors, actuators, Arduino and necessary interfacing wires, relays, switches, etc.

**List of Open Source Software/learning website:**

- <http://www.scilab.org/>
- <http://www.gnu.org/software/octave/>
- <http://www.vlab.co.in>
- <http://www.arduino.cc>

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# GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3150913

Semester – V

Subject Name: DISASTER MANAGEMENT

Type of course: Applied Mechanics

Prerequisite: NA

**Rationale:** This subject is conceptual applications of principles of management to mitigate various disasters.

**Teaching and Examination Scheme:**

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

0

**Content:**

Sr. No.	Content	Total Hrs
1	Understanding Disasters Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Capacity – Disaster and Development, and disaster management	4
2	Types, Trends, Causes, Consequences and Control of Disasters Geological Disasters (earthquakes, landslides, tsunami, mining); Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves); Biological Disasters (epidemics, pest attacks, forest fire); Technological Disasters (chemical, industrial, radiological, nuclear) and Manmade Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemicals and biological disasters); Global Disaster Trends – Emerging Risks of Disasters – Climate Change and Urban Disasters	8
3	Disaster Management Cycle and Framework Disaster Management Cycle – Paradigm Shift in Disaster Management Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Micro zonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development; Awareness During Disaster – Evacuation – Disaster Communication – Search and Rescue – Emergency Operation Centre – Incident Command System – Relief and Rehabilitation – Post-disaster – Damage and Needs Assessment, Restoration of Critical Infrastructure – Early Recovery – Reconstruction and Redevelopment;	8



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	IDNDR, Yokohama Strategy, Hyogo Framework of Action	
<b>4</b>	Disaster Management in India Disaster Profile of India – Mega Disasters of India and Lessons Learnt Disaster Management Act 2005 – Institutional and Financial Mechanism National Policy on Disaster Management, National Guidelines and Plans on Disaster Management; Role of Government (local, state and national), Non-Government and Inter-Governmental Agencies	<b>10</b>
<b>5</b>	Applications of Science and Technology for Disaster Management & Mitigation Geoinformatics in Disaster Management (RS, GIS, GPS and RS) Disaster Communication System (Early Warning and Its Dissemination) Land Use Planning and Development Regulations Disaster Safe Designs and Constructions Structural and Non-Structural Mitigation of Disasters S&T Institutions for Disaster Management in India	<b>12</b>

**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
<b>10</b>	<b>50</b>	<b>30</b>	<b>10</b>	<b>0</b>	<b>0</b>

**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:**

**Course Outcomes:**

Sr. No.	CO statement	Marks % weightage
CO-1	Explain types, trends, causes consequences and control of disaster	30
CO-2	Recall disaster management cycle and frame work	20
CO-3	Summarize disaster management agencies and their roles in india.	20



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CO-4	Relate applications of sciences and technology for disaster management and mitigation.	30
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# GUJARAT TECHNOLOGICAL UNIVERSITY

**Bachelor of Engineering**

**Subject Code: 3151108**

**Semester – V**

**Subject Name: Python Programming**

**Type of course:** Open Elective Subject

**Prerequisite:** Fundamental knowledge about computer systems and positive aptitude to learn programming, Basic knowledge of C Programming.

## **Rationale:**

Python is general purpose programming language becomes very popular in last decade. In this age, every Electronics, Electrical and Computer engineers must learn Python Programming to build applications in their core domain. Python is becoming popular in artificial intelligence and machine learning. MicroPython is sub-set of Python Programming useful to port in hardware for embedded and IoT 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)	
2	0	2	3	70	30	30	20	150

## **Content:**

Sr. No.	Content	Total Hrs	% Weight age
1	<b>Introduction, Data Types and Operators:</b> Installation and working with Python, Variables and data types in python, Perform computations and create logical statements using Python's operators: Arithmetic, Assignment, Comparison, Logical, Membership, Identity, Bitwise operators, list, tuple and string operations	6	20%
2	<b>Python Decision making and Loops:</b> Write conditional statements using If statement, if ...else statement, elif statement and Boolean expressions, While loop, For loop, Nested Loop, Infinite loop, Break statement, Continue statement, Pass statement, Use for and while loops along with useful built-in functions to iterate over and manipulate lists, sets, and dictionaries. Plotting data, Programs using decision making and loops.	8	20%
3	<b>Python Functions and Modules:</b> Defining custom functions, Organising Python codes using functions, Create and reference variables using the appropriate scope, Basic skills for working with lists, tuples, work with dates and times, get started with	6	20%



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	dictionaries, Importing own module as well as external modules, Programming using functions, modules and external packages		
4	<b>Python File Operations:</b> An introduction to file I/O, use text files, use CSV files, use binary files, Handle a single exception, handle multiple exceptions, Illustrative programs, Exercises	4	15%
5	<b>MicroPython:</b> Introduction, main difference between MicroPython and Python, Installation of MicroPython on Hardware, MicroPython libraries, GPIO programming on MicroPython Hardware, Sensor Programming using MicroPython	8	25%

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

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	20	25	15	10	10

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

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

### Reference Books:

1. John V Guttag. "Introduction to Computation and Programming Using Python", Prentice Hall of India
2. Python Programming Fundamentals- A Beginner's Handbook by Nischay kumar Hegde
3. Kenneth A. Lambert, "Fundamentals of Python – First Programs", CENGAGE Publication
4. Introduction to Python for Engineers and Scientists, By. Sandeep Nagar, Apress
5. MicroPython for the Internet of Things (A Beginner's guide to programming with Python on microcontrollers) By. Charles Bell, Apress

### Course Outcomes:

After completion of this course students will be able ...

Sr. No.	CO statement	Marks % weightage
CO-1	To test and debug code written in python	25



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CO-2	To create applications using Python Programming	20
CO-3	To perform file operations to read and write data in files	25
CO-4	To write programs for general purpose I/O devices using MicroPython	30

### List of Experiments:

- [1] Write Python programs to understand control structures
- [2] Write Python programs to understand list and tuples
- [3] Use conditional statements and loops in Python programs
- [4] Write python programs to create functions and use functions in the program
- [5] Import module and use it in Python programs
- [6] Write python program to plot data using PyPlot
- [7] To become familiar with MicroPython and NodeMCU. Configure NodeMCU for MicroPython.
- [8] Write program in MicroPython to send digital data on GPIO pins of NodeMCU and glow LED connected with NodeMCU or any other MicroPython supported board.
- [9] Connect Digital/Analog I/O module with NodeMCU and write program to display temperature in MicroPython.
- [10] Connect NodeMCU with with WiFi Access Point and transmit data from NodeMCU to Cloud. Connect Digital/Analog I/O module with NodeMCU and send temperature and light data on cloud (Thingspeak, Firebase or any other cloud service)

### Major Equipment/software:

- NodeMCU boards or any other microcontroller board supporting MicroPython firmware
- Digital analog Input Output boards consisting LEDs, Switches, LDR, Temperature sensor, POT

### List of Open Source Software/learning website:

- NPTEL Video lecture on Python Programming
- <https://www.coursera.org/learn/python-programming>
- Python Software





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- Turtle - <https://docs.python.org/2/library/turtle.html>
- PyLab - <https://scipy.github.io/old-wiki/pages/PyLab>
- Anaconda software

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# GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3151910

Semester – V

Subject Name: Operation Research

Type of course: Humanities and Social Science

Prerequisite: Nil

### Rationale:

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

### Teaching and Examination Scheme:

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

### Content:

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



# GUJARAT TECHNOLOGICAL UNIVERSITY

## Bachelor of Engineering

Subject Code: 3151910

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

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

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

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

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

### Reference Books:

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



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**Bachelor of Engineering**  
**Subject Code: 3151910**

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

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

**Term Work:**

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

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