



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 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

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	The Contributor Work Ideal <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	Identity & Self-esteem <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	Become a Creator of one’s destiny <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	Achieving Sustainable Success <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>	
5	Career Development Models <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
6	Expanding contribution in every role <i>In this topic, students explore the many roles they can play in their life & discover the power they have to expand the contribution possible in any role. (E.g. role of student, role of manager, role of a project site engineer). So, the potential of a role is in the individual's hands. This opens their mind to an alternative way of career growth.</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
Outcome of theory sessions		
CO-1	Students will be able to recognize & appreciate two alternative ideals of work – ideal of a “worker” and ideal of a “contributor”. And why organizations of today expect people they employ to be contributors and not just workers.	10-12%
CO-2	Students will be able to recognize & appreciate alternative ways in which they could define themselves or “who am I” (their identity) – and which are positive identities that will lead to building intrinsic self-esteem and confidence in oneself; in contrast to identities that will lead to extrinsic self-esteem that makes them	10-12%



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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%
Outcome of practical sessions		
CO-7	Students learn to re-interpret their life and college experiences to showcase their contribution affinities which are relevant for employers.	15%
CO-8	Students learn to apply contributor thinking to real-world or career relevant challenges.	15%



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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	70	30	30	20	150	

Content:

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



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

BASIC STUDY MATERIAL / MAIN COURSE WORK-BOOK -

1. IPDC Workbook-I
2. IPDC Workbook-II

IPDC REFERENCES –

- *These are the reference material for each lectures of IPDC.*

Module No.	Module/ Course Topics	Lectures	References
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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">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
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, 20172. Playing It My Way: My Autobiography, Sachin Tendulkar, Hodder & Stoughton, 20143. The Wit and Wisdom of Ratan Tata, Ratan Tata, Hay House, 20184. The Tata Group: From Torchbearers to Trailblazers, Shashank Shah, Penguin Portfolio, 20185. The Leader Who Had No Title, Robin Sharma, Jaico Publishing House, 20106. 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, 20172. The Fast Forward MBA in Project Management, Eric Verzuh, Wiley, 20113. Guide to Project Management: Getting it right and achieving lasting benefit, Paul Roberts, Wiley, 2013



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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"> 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. The Rise of Civilization in India and Pakistan, Raymond Allchin, Bridget Allchin, Cambridge University Press, 1982 5. The Āryabhaṭīya of Āryabhaṭa: An Ancient Indian Work on Mathematics and Astronomy (1930), Walter Eugene Clark, University of Chicago Press, reprint, Kessinger Publishing, 2006
5	Remaking Yourself	<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"> 1. Power of Habit, Charles Duhigg, Random House Trade Paperbacks, 2014 2. Change Your Habit, Change Your Life, Tom Corley, North Loop Books, 2016 3. The Seven Habits of Highly Effective People, Stephen Covey, Simon & Schuster, 2013 4. Seven Habits of Highly Effective Teens, Sean Covey, Simon & Schuster, 2012 5. Atomic Habits, James Clear, Random House, 2018 6. How a handful of tech companies control billions of minds every day, Tristan Harris, TED Talk, 2017
6	Financial Wisdom	<p>Basics of Financial Planning Financial Planning Process</p>	<ol style="list-style-type: none"> 1. Rich Dad Poor Dad, Robert Kiyosaki, Plata Publishing, 2017 2. The Warren Buffett Way, Robert Hagstrom, Wiley, 2013 3. The Intelligent Investor, Benjamin Graham, Harper Business, 2006 4. Yogic Wealth: The Wealth That Gives Bliss, Gaurav Mashruwala, TV18 Broadcast Ltd, 2016
7	From House to Home	<p>Affectionate Relationships Forgive & Forget Listening & Understanding Bonding the Family</p>	<ol style="list-style-type: none"> 1. “What Makes a Good Life? Lessons from the Longest Study on Happiness”, R. Waldinger, Ted Talks, 2015 2. Long Walk To Freedom, Nelson Mandela, Back Bay Books, 1995 3. Outliers, Malcolm Gladwell, Back Bay Books, 2011



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8	Soft Skills	Teamwork & Harmony Networking - Decision Making - Leadership	<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.



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Bachelor of Engineering

Subject Code: 3151908

Semester –V

Subject Name: Control Engineering

Type of course: Open elective

Prerequisite: None

Rationale:

To develop comprehensive knowledge and understanding of classical and modern control theory, industrial automation, and systems analysis. Control engineering is a diverse and rapidly expanding discipline which has become increasingly important in a wide range of industries.

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	Basic concepts of control system: Control System, Basic components of control system, classification of control system, Closed loop control versus open loop control, Servomechanism, Regulator and process control, Example of control system.	03
2	Modelling of control systems: Transfer function and impulse response function, Procedure for determining the transfer function of a control system, Block diagram of system, signal flow graph representation of physical systems along with rules, properties, Automatic control system, Lineatization of nonlinear mathematical model, mathematical modeling of Mechanical systems and Elactrical systems, Mathematuical modeling of pneumatic and hydraulic systems, Fluid systems and Thermal systems.	09
3	Modelling in time domain and its response analysis: Standard test signals along with examples of their usage, Applying state space representation, converting transfer function to state space, converting state space to transfer function, diagonalisation of state matrix, solution of state equation, concepts of controllability and observability, Poles, Zeros, and System response, First order systems, Second order systems, Higher order systems, Transient response analysis, Routh's stability criterion, Effects of Integral and Derivative control, steady state errors of feedback control systems, Root Locus plot, Lead Compensation, Lag compensation, Lag-Lead	09



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Subject Code: 3151908

	compensation, Parallel Compensation.	
4	Frequency response analysis: Bode diagram, Polar plots, Log Magnitude versus Phase plot, Nyquist stability criterion, Stability analysis, Relative stability analysis, closed loop frequency response of unity feedback system, experimental determination of transfer function, control system design by frequency response approach, Lead Compensation, Lag compensation, Lag-Lead compensation	08
5	PID controllers Tuning PID controllers, Design PID controllers, Modification of PID control, Two degree of freedom control	04
6	Hydraulic control system: Basic elements of hydraulic circuit, Principle used in hydraulic circuit, Sources of hydraulic power, Integral, Derivative, PD & PID controller with its transfer function, Comparison between hydraulic and electrical control system.	04
7	Pneumatic control system: Basic elements of pneumatic circuit, Difference between pneumatic and hydraulic control systems, Force balance and force distance type controllers, Nozzle-flapper amplifier, PD, PI and PID control system along with its transfer function.	04

Reference Books:

References:

1. Modern control theory, Katsuhiko Ogata, Pearson Education International, Fifth edition.
2. Control system engineering, Norman S Nise, John Wiley & Sons, Inc., Sixth edition
3. Control system engineering, S. K. Bhattacharya, Pearson India
4. Modern control systems, Richard C. Dorf, Robert H Bishop, Pearson Education International, Twelfth edition.
5. Automatic control systems, Farid Golnaraghi, Benjamin C Kuo, John Wiley & Sons, Inc., Ninth edition
6. Control System Engineering, J.Nagrath and M.Gopal New Age International Publishers, 5th Edition, 2007

Distribution of marks weightage for cognitive level

Bloom's Taxonomy for Cognitive Domain	Marks % weightage
Recall	10
Comprehension	10
Application	30
Analysis	40
Evaluate	05
Create	05



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Course Outcome:

After learning the course the students will able to:

Sr. No.	CO statement	Marks % weightage
CO-1	Summarized fundamentals of control systems and components of control systems.	15
CO-2	Demonstrate the methodology for modelling mechanical, hydraulic and pneumatic systems for control.	30
CO-3	Develop the transfer functions, state space representation and block diagrams of physical systems for its control and stability.	20
CO-4	Analyze time domain and frequency domain responses of mechanical systems.	40
CO-5	Make use of PID controllers for control of physical systems.	15

Major Equipment:

1. Computational facility.

List of Open Source Software/learning website:

1. <http://nptel.ac.in>



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Bachelor of Engineering
Subject Code:3151909
Semester –V
Subject Name:Heat Transfer

Type of course:Professional Core Course

Prerequisite: Nil

Rationale: The course is prepared to provide the detailed understating of various modes of heat transfer and its applications in Mechanical Engineering. The course also provides the basic technical knowledge related to heat exchangers.

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.	Course Content	Total Hours
1	Conduction: Fourier's law, effect of temperature on thermal conductivity of different solids, liquids and gases, generalized equation in Cartesian, cylindrical and spherical coordinates and its reduction to specific cases, One dimensional steady state conduction, heat conduction through plane and composite walls, cylinders and spheres, electrical analogy, critical radius of insulation for cylinder and sphere, overall heat transfer coefficient Heat transfer from extended surface: Types of fin, heat flow through uniform cross-sectional area fin for various cases like infinitely long fin, fin insulated at the tip and fin losing heat at the tip, efficiency and effectiveness of fin, Estimation of error in temperature measurement in a thermometer well Transient heat conduction: lumped capacitance method for bodies of infinite thermal conductivity, time constant, one dimensional transient heat conduction in plane wall with finite conduction and convective resistances	18
2	Convection: Newton's law of cooling, dimensional analysis applied to forced and free convection, dimensionless numbers and their physical significance, empirical correlations for free and forced convection, Continuity, momentum and energy equations, thermal and hydrodynamic boundary layer, Blasius solution for laminar boundary layer, General solution for Von-Karman integral momentum equation	12
3	Radiation: Absorptivity, reflectivity and transmissivity, black, white and grey body, emissive power, emissivity, Kirchhoff's law, Planck's law, Rayleigh-Jeans' law, Wien's law, Wien's displacement law, Stefan-Boltzmann law, intensity of radiation, radiation heat exchange between black bodies, shape factor, electrical analogy, radiation heat exchange between gray bodies, radiosity, irradiation, radiation shields	12
4	Heat exchanger: Classification, heat exchanger analysis, LMTD for parallel and counter flow exchanger, condenser and evaporator, overall heat transfer coefficient, fouling factor, correction factors for multi pass arrangement, effectiveness-NTU method for parallel and counter flow heat exchanger, introduction of heat pipe and compact heat exchanger	8



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5	Two-phase heat transfer: Boiling of liquids, Pool boiling curve, modes of pool boiling, correlation for pool boiling, condensation of vapor, film wise and drop wise condensation, condensation on flat surfaces and horizontal tubes	6
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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
10	20	60	10	0	0

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

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

Reference Books:

1. Heat and Mass Transfer by P.K. Nag, McGraw Hill
2. Heat and Mass Transfer: Fundamentals and Application by Yunus Cengel, McGraw Hill
3. Fundamental of Heat and Mass Transfer by Incropera and Dewitt, Wiley Publication
4. Heat Transfer by Mills and Ganesan, Pearson Education
5. Heat Transfer by J P Holman, McGraw Hill
6. Heat and Mass Transfer by R K Rajput, S.Chand Publication

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	To classify the heat transfer problems and to apply the principles of steady state one dimensional heat transfer, extended surface and unsteady state conduction for commonly encountered Mechanical engineering problems.	32
CO-2	To identify the type of convection problems and to apply concepts of natural and forced convection for related problems	22
CO-3	To explain various laws of radiation heat transfer and to determine the radiation heat transfer between black and grey surfaces of simple Mechanical systems	20
CO-4	To practice LMTD and effectiveness-NTU method for simple heat exchange device	16
CO-5	To identify types of boiling and condensation heat transfer process and to use the same to estimate heat transfer coefficient for simple cases	10

List of Experiments:(at least ten experiments from the following list should be performed)

1. To determine the thermal conductivity of given metal rod
2. To determine the thermal conductivity of the given composite walls.
3. To determine Stephan Boltzmann constant experimentally.
4. To determine heat transfer co-efficient by forced convection.
5. To determine heat transfer co-efficient by natural convection.
6. To determine the overall heat transfer co-efficient of shell and tube type heat exchangers.
7. To determine the emissivity of gray body.
8. To study film and drop wise condensation and to determine the film co-efficient



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9. To measure convective heat transfer co-efficient and effectiveness of the fin under forced convection.
10. To measure convective heat transfer co-efficient and effectiveness of the fin under natural convection.
11. To determine heat transfer co-efficient for hair pin heat exchanger.
12. To determine heat transfer co-efficient for transient heat transfer process.
13. To determine critical radius of insulation.

Major Equipment: Hair pin heat exchanger, Shell and tube heat exchanger, Pin fin apparatus, Emissivity measurement apparatus, Composite wall apparatus, Stefan Boltzman apparatus, Natural and force convection apparatus, transient heat transfer apparatus, critical radius apparatus, film and drop wise condensation apparatus

List of Open Source Software/learning website: <http://nptel.ac.in/>

GTUQuestionPapers.com



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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	<p>Operations Research: Origin of Operation Research, Historical Standpoint, Methodology, Different Phases, Characteristics, Scope and Application of Operations Research.</p> <p>Linear Programming Problem: 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.</p> <p>Introduction of Primal and Dual Problems, Economic Interpretation. Introduction of Goal and Integer Programing.</p> <p>Dynamic Programming: Steps involved in dynamic programming, characteristics and explanation of dynamic programming, formulation of Deterministic and probabilistic dynamic programming.</p>	12
2	<p>Transportation and Assignment: 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.</p>	09
3	<p>Queuing Theory: Basis of Queuing theory, elements of queuing theory, Kendall's Notation, Operating characteristics of a queuing system, Classification of Queuing models, Preliminary</p>	04



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	examples of M/M/1:∞/∞/FCFS.	
4	Replacement theory: Introduction, Replacement of capital equipment which depreciated with time, replacement by alternative equipment, Group and individual replacement policy.	04
5	Game Theory: 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	Decision Theory: 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	Project Management: Introduction to PERT and CPM, Critical Path calculation, float calculation and its importance. Cost reduction by Crashing of activity.	08
	Total Hours	45

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



GUJARAT TECHNOLOGICAL UNIVERSITY

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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



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Bachelor of Engineering

Subject Code: 3151911

Semester – V

DYNAMICS OF MACHINERY

Type of course: Professional Core

Prerequisite: Kinematics and theory of machines

Rationale: The course is designed to give fundamental knowledge of behavior of machines under dynamic condition.

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	Dynamic force analysis of mechanisms: Introduction, D’alembert’s principle, equivalent offset inertia force, dynamic analysis of four link mechanism, dynamic analysis of slider crank mechanism, velocity & acceleration of piston, angular velocity & angular acceleration of connecting rod, engine force analysis, dynamically equivalent system inertia of the connecting rod, inertia force in reciprocating engines.	04
2	Turning moment diagrams and flywheel Turning moment diagram for various type of engines, fluctuation of energy, fluctuation of speed, flywheel, energy stored in flywheel, dimensions of flywheel rims, flywheel in punching presses	04
3	Balancing: Introduction, static balancing, dynamic balancing, transference of force from one plane to another plane, balancing of several masses in different planes, force balancing of linkages, balancing of reciprocating mass, balancing of locomotives, Effects of partial balancing in locomotives, secondary balancing, balancing of inline engines, balancing of v-engines, balancing of radial engines, balancing machines.	11
4	Gyroscope: Angular velocity, angular acceleration, gyroscopic torque, gyroscopic effect on naval ships, aero plane, stability of an automobile, stability of two wheel vehicle	05
5	Free vibrations and damped free vibrations: Types of vibrations, elements constituting vibration, spring mass system, free undamped vibrations, equation of motion, equivalent spring stiffness, free damped vibrations, equation of motion for viscous damper, damping factor, under damped system, critically damped system, over damped system, logarithmic decrement, free torsional vibration of a two and three rotor system, torsionally equivalent shaft, torsional vibration of a geared system.	12



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6	Forced damped vibrations: Analytical solution of forced damped vibration, vector representation of forced vibrations, Magnification factor, force transmissibility, forced vibration with rotating and reciprocating unbalance, forced vibration due to excitation of support, vibration frequency measurement.	08
7	Critical speeds of shafts: Critical speed of shaft carrying single rotor and having no damping, Critical speed of shaft carrying single rotor and having damping, secondary critical speeds in horizontal shafts, critical speed of shaft having multiple rotors.	05

Reference Books:

1. Theory of Machines, S.S.Rattan , Tata Mc-Graw Hill.
2. Mechanical Vibrations and Noise Engineering, A. G. Ambekar, Prentice Hall of India.
3. Dynamics of Machinery, Farazdak Haideri, Nirali Prakashan.
4. Dynamics of Machines, S. Balaguru, Cengage Learning India Pvt. Ltd.
5. Kinematics and Dynamics of Machinery, Norton R L, McGraw-Hill
6. Theory of Machines : Kinematics and Dynamics, Sadhu Singh, Pearson

Distribution of marks weightage for cognitive level

Bloom's Taxonomy for Cognitive Domain	Marks % weightage
Recall	10
Comprehension	10
Application	30
Analysis	40
Evaluate	10
Create	05

Course Outcome:

After learning the course the students will able to:

Sr. No.	CO statement	Marks % weightage
CO-1	Summarize dynamic forces and turning moments in mechanisms.	15
CO-2	Minimize unbalance in mechanical systems by means of static and dynamic balancing.	20
CO-3	Analyze gyroscopic effect in aeroplane, ships and automobiles.	10
CO-4	Demonstrate longitudinal vibrations, transverse vibrations and torsional vibrations in single degree of freedom systems .	40
CO-5	Determine critical speed of the shaft.	15



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List of Experiments:

Practical should be designed to include followings experiments:

1. Static and dynamic balancing of rotating masses.
2. Understanding of gyroscopic effect using motorized gyroscope.
3. Longitudinal free vibration of spring mass system.
4. Study of torsional vibration in shaft (single rotor and two rotor system)
5. Study of free damped vibration and logarithmic decrement.
6. Study of forced damped vibration.
7. Critical speed of the shaft.
8. Study of dynamic forces and turning moments in mechanisms.

Major Equipment:

1. Universal vibration apparatus.
2. Motorised gyroscope.

List of Open Source Software/learning website:

1. <http://nptel.ac.in>

GTUQuestionPapers.com



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3151912

Semester – V

Subject Name: Manufacturing Technology

Type of course:

Prerequisite:

Rationale: The Manufacturing Technology subject is designed to acquire theoretical and practical knowledge in foundry, metal forming, metal joining, manufacturing processes and plastic processing. The manufacturing program provides relevant industrial experience within the academic environment to apply theoretical and practical concepts to improve manufacturing processes and mechanical or manufacturing components.

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	Manufacturing Technology: Importance of manufacturing, economic and technological definition of manufacturing, Classification of manufacturing processes, Selection of Manufacturing process	03
2	Foundry Technology: Patterns practices: Types of patterns, allowances and material used for patterns, moulding materials, moulding sands, Moulding sands; properties and sand testing; grain fineness; moisture content, clay content and permeability test, core materials and core making, core print; core boxes, chaplets, gating system design. Moulding practices: Green, dry and loam sand moulding, pit and floor moulding; shell moulding; permanent moulding; carbon dioxide moulding. Casting practices: Fundamental of metal casting, Sand casting, Shell-Mould casting, Mold casting (plaster and ceramic), Investment casting, Vacuum casting, Permanent mould casting, Slush casting, Pressure casting, Die casting, Centrifugal casting, Continuous casting, Squeeze casting, Casting alloys, Casting defects, Design of casting, Gating system design, and riser design. Melting furnaces-rotary, Pit electric, Tilting and cupola. Metallurgical considerations in casting elements of gating system, and risers and their design.	10
3	Metal Joining Processes: Principle of welding, soldering, Brazing and adhesive bonding. Classification of welding and allied processes. Gas welding and gas cutting, Principle, Oxyacetylene welding	10



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	equipment, Oxyhydrogenwelding. Flame cutting. Arc welding, Power sources and consumables, Gas weldingand cutting, Processes and Equipment. Resistance welding, Principle and Equipment, Spot,Projection and seam welding process, Atomic hydrogen, ultrasonic, Plasma and laser beamwelding, Electron beam welding, and special welding processes e.g. TIG, MIG, friction andexplosive welding, welding of C.I. and Al, Welding defects. Electrodes and Electrode Coatings,Welding positions.	
4	Forming and Shaping Processes: Metal working, Elastic and plastic deformation, Concept of strain hardening, Hot and cold Working, Rolling: Principle and operations, Roll pass sequence, Extrusion, Wire and tube drawing processes.Forging: Method of forging, Forging hammers andpresses, Principle of forging tool design,Cold working processes: Shearing, Drawing,Squeezing, Blanking, Piercing, deep drawing, Coining and embossing, Metal working defects,cold heading, Riveting, Thread rolling bending and forming operation.	10
5	Plastic Technology: Introduction, Classification of Plastics, Ingredients of Moulding compounds, General Properties ofPlastics, Plastic part manufacturing processes such as compression moulding,Transfermoulding, Injection moulding, Extrusion moulding, Blow moulding, Calendaring, Thermoforming,slush moulding, laminating	06
6	Advance Super finishing Technology: Introduction, Lapping, Horning, Buffing, Barrel Tumbling, Burnishing, Powder coating, Polishing.	06

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

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	30	30	10	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. Production technology, by R.K. Jain, Khanna publishers.
2. Production Technology by P.C. Sharma S Chand & Co Ltd.
3. Manufacturing Technology Vol-II, By P.N. Rao, Tata McGraw Hill.
4. Manufacturing Engg. And Technology By S. Kalpakajain, PHI/Pearson.
5. Welding technology, by O.P.Khanna, DhanpatRai publishers.

Course Outcomes:Students will be able to



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Sr. No.	CO statement	Marks % weightage
CO-1	Interpret foundry practices like pattern making, mold making, Core making and Inspection of defects.	25%
CO-2	Differentiate various metal forming processes	25%
CO-3	Select appropriate metal joining Processes to join similar or dissimilar metals.	25%
CO-4	Classify different plastic moulding processes and application	13%
CO-5	Distinguish different Super Finishing Technology	12%

Term Work:

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

List of Experiments:

Experiments based on syllabus contents including workshop job of:

1. Casting Processes
2. Welding Processes
3. Sheet metal working
4. Plastic processes

Major Equipment:

Mechanical Press
Small foundry shop
Welding Machine: Arc welding machine, Gas welding machine, TIG, Spot welding etc..

List of Open Source Software/learning website:

NPTEL notes and videos



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3151913

Semester – 5
Subject Name: Oil Hydraulics and Pneumatics

Type of course: NA

Prerequisite: Nil

Rationale: Course gives idea about the basic system working on fluid power and compressed air. Also different valves related to hydraulic and pneumatic systems are discussed in syllabus. Subject is also useful for designing the various hydraulic and pneumatic circuits for various engineering 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	0	3	70	30	0	0	100

Content:

Sr. No.	Content	Total Hrs
1	Introduction: Introduction, Global fluid power Scenario, Basic system of Hydraulics-Major advantages and disadvantages, Comparison among Electrical, Hydraulics and Pneumatics System, Principles of Hydraulic Fluid power, Hydraulic Symbols, Electrical Elements used in hydraulic circuits. Basic Requirements for Pneumatic System, Basic Symbols of Pneumatic Systems, Applications of Pneumatics. Electrical elements used in Pneumatic System.	08
2	Hydraulic Oils, Fluid Properties and Filter: Types, Properties, physical characteristics & functions of hydraulic Oils, Classification Mineral based, Fire resistant & Biodegradable Oils, Filters, Contaminations, location of filter.	06
3	Hydraulic Pumps, Motors, Valves and Actuators: Classification of hydraulic pumps, Gear Pumps, Vane Pumps, Piston Pumps, Axial piston pumps, Hydraulic motors, Direction control valves, Pressure control valves, Flow control valves, Non-return valves, Reservoirs, Accumulators, Heating & cooling devices, Hoses. Types of Hydraulic Actuators, Selection criterion of Actuators, Linear and Rotary Actuators, Hydrostatic Transmission Systems.	10
4	Air Preparation and Service Unit: Types & Selection criteria for Air Compressors, Air receiver, Pipeline Layout, Air filter, Pressure regulator and Lubricator (FRL unit).	05



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5	Pneumatic Cylinders, Motors and Valves: Types of Pneumatic Cylinders & Air motors, Cushion assembly, mounting Arrangements, Pneumatic Direction control valves, Quick exhaust, Time delay Shuttle and Twin pressure valves.	05
6	Circuit Design: Basic hydraulic circuits, Industrial hydraulic circuits, Power losses in flow control circuits, Basic pneumatic circuits, Development of single Actuator Circuits, Development of multiple Actuator Circuits, Cascade method for sequencing	06
7	Automation and Simulation of Hydraulics and Pneumatics: Introduction to Automation in hydraulic and Pneumatic Systems, Case study of Automation using Hydraulics and pneumatics. Introduction to software of hydraulic and Pneumatic system, Circuit designing in software, Simulation in software, Simulation with actual component using software like automation in industry	04
	Total	45

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

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	30	30	10	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. Industrial Hydraulics by John Pippenger and Tyler Hicks, McGraw Hill.
2. Oil Hydraulic Systems, Principle and Maintenance by S R Majumdar, McGraw-Hill.
3. Fluid Power with Applications by Anthony Esposito, Pearson.
4. Fluid Power: Generation, Transmission and Control, Jagadeesha T., ThammaiahGowda, Wiley.
5. The Analysis & Design of Pneumatic Systems by B. W. Anderson, John Wiley.
6. Control of Fluid Power Analysis and Design by Mc Clay Donaldson, Ellis Horwood Ltd.
7. Hydraulic and Pneumatic Controls: Understanding made Easy, K.ShanmugaSundaram, S.Chand& Co Book publishers, New Delhi, 2006 (Reprint 2009)
8. Basic Pneumatic Systems, Principle and Maintenance by S R Majumdar, McGraw-Hill.



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9. Basic fluid power Dudley, A. Pease and John J. Pippenger, , Prentice Hall, 1987

Course Outcomes:Students will be able to:

Sr. No.	CO statement	Marks % weightage
CO-1	Demonstrate components for hydraulic and pneumatic systems and their applications.	20
CO-2	Interpret functions of different hydraulic and pneumatic valves and make use of them in circuit design.	30
CO-3	Design and analyze hydraulic and pneumatic circuits for specific applications.	35
CO-4	Compile and make use of automation in hydraulic and pneumatic systems.	15

List of Open Source Software/learning website:

1. NPTEL
2. Simulation Software of Hydraulic Pneumatic system.