GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject code: 3160002
Contributor Personality Development Program

SEMESTER VI

Type of course: Work-Personality Development

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

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

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

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

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

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

COURSE CONTENT :

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

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

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Subject code: 3160002

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

Reference resources:

A. Basic reference for both students and teachers

1. Contributor Personality Program textbook cum workbook developed by Illumine

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

B. Advanced reference for teachers

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

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Subject code: 3160002

Course Outcomes:

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

GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject code: 3160003
INTEGRATED PERSONALITY DEVELOPMENT COURSE

SEMESTER VI

TYPE OF COURSE –

- Value-based holistic personality development course for university students.

RATIONALE -

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

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

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

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

COURSE CONTENT :

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

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

BASIC STUDY MATERIAL / MAIN COURSE WORK-BOOK -

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

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

Module No.	Module/ Course Topics	Lectures	References
1	Facing Failures	Factors Affecting Failures Failures are not Always Bad Insignificance of Failures Power of Faith Practicing Faith	1. Thomas Edison's factory burns down, New York Times Archives, Page 1, 10/12/1914 2. Lincoln Financial Foundation, Abraham Lincoln's "Failures": Critiques, Forgotten Books, 2017 3. J.K. Rowling Harvard Commencement Speech	Harvard University Commencement, 2008 4. Born Again on the Mountain: A Story of Losing Everything and Finding It Back, Arunima Sinha, Penguin, 2014 5. Failing Forward: Turning Mistakes Into Stepping Stones for Success, John C. Maxwell, Thomas Nelson, 2007 6. Steve Jobs: The Exclusive Biography Paperback, Walter Isaacson, Abacus, 2015

2	Learning from Legends	Tendulkar & Tata Leading Without Leading	1. Chase Your Dreams: My Autobiography, Sachin Tendulkar, Hachette India, 2017 2. Playing It My Way: My Autobiography, Sachin Tendulkar, Hodder & Stoughton, 2014 3. The Wit and Wisdom of Ratan Tata, Ratan Tata, Hay House, 2018 4. The Tata Group: From Torchbearers to Trailblazers, Shashank Shah, Penguin Portfolio, 2018 5. The Leader Who Had No Title, Robin Sharma, Jaico Publishing House, 2010 6. In the Joy of Others: A Life Sketch of Pramukh Swami Maharaj, Mohanlal Patel and BAPS Sadhus, Swaminarayan Aksharpith, 2013
3	Mass Management	Project Management	1. Project Management Absolute Beginner's Guide, Gregory Horine, Que Publishing, 2017 2. The Fast Forward MBA in Project Management, Eric Verzuh, Wiley, 2011 3. Guide to Project Management: Getting it right and achieving lasting benefit, Paul Roberts, Wiley, 2013
4	My India My Pride	Glorious Past - Part 1 Glorious Past - Part 2 Present Scenario An Ideal Citizen - 1 An Ideal Citizen - 2 An Ideal Citizen - 3	1. Hidden Horizons, Dr. David Frawley and Dr. Navaratna S. Rajaram, 2006 2. Rishis, Mystics and Heroes of India, Sadhu Mukundcharandas, Swaminarayan Aksharpith, 2011 3. Physics in Ancient India, Narayan Dongre, Shankar Nene, National Book Trust, 2016 4. The Rise of Civilization in India and Pakistan, Raymond Allchin, Bridget Allchin, Cambridge University Press, 1982 5. The Āryabhaṭīya of Āryabhaṭa: An Ancient Indian Work on Mathematics and Astronomy (1930), Walter Eugene Clark, University of Chicago Press, reprint, Kessinger Publishing, 2006
5	Remaking Yourself	Restructuring Yourself Power of Habit Being Addiction-Free Begin with the End in Mind Handling the Devil – Social Media	1. Power of Habit, Charles Duhigg, Random House Trade Paperbacks, 2014 2. Change Your Habit, Change Your Life, Tom Corley, North Loop Books, 2016 3. The Seven Habits of Highly Effective People, Stephen Covey, Simon & Schuster, 2013 4. Seven Habits of Highly Effective Teens, Sean Covey, Simon & Schuster, 2012 5. Atomic Habits, James Clear, Random House, 2018 6. How a handful of tech companies control billions of minds every day, Tristan Harris, TED Talk, 2017

6	Financial Wisdom	Basics of Financial Planning Financial Planning Process	1. Rich Dad Poor Dad, Robert Kiyosaki, Plata Publishing, 2017 2. The Warren Buffett Way, Robert Hagstrom, Wiley, 2013 3. The Intelligent Investor, Benjamin Graham, Harper Business, 2006 4. Yogic Wealth: The Wealth That Gives Bliss, Gaurav Mashruwala, TV18 Broadcast Ltd, 2016
7	From House to Home	Affectionate Relationships Forgive & Forget Listening & Understanding Bonding the Family	1. "What Makes a Good Life? Lessons from the Longest Study on Happiness", R. Waldinger, Ted Talks, 2015 2. Long Walk To Freedom, Nelson Mandela, Back Bay Books, 1995 3. Outliers, Malcolm Gladwell, Back Bay Books, 2011
8	Soft Skills	Teamwork & Harmony Networking - Decision Making - Leadership	1. The 17 Indisputable Laws of Teamwork, John Maxwell, HarperCollins, 2013 2. Team of Teams: New Rules of Engagement for a Complex World, Stanley McChrystal, Portfolio, 2015 3. Predictably Irrational, Revised and Expanded Edition: The Hidden Forces That Shape Our Decisions, Harper Perennial, Dan Ariely, 2010
9	Review	Student Voice – 1 Student Voice – 2 Words of Wim	

COURSE OUTCOMES –

- To provide students with a holistic education – focused on increasing their intelligence quotient, physical quotient, emotional quotient and spiritual quotient.

- To provide students with hard and soft skills, making them more marketable when entering the workforce.

- To educate students on their social responsibilities as citizens of India and have a greater sense of social responsibility.

- To provide students with a value-based education which will enable them to be successful in their family, professional, and social relationships by improving their moral and ethical values.

- To teach self-analysis and self-improvement exercises to enhance the potential of the participants.

- To have a broader sense of self-confidence and a defined identity.

GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3160620
SUBJECT NAME: INSTRUMENTATION AND SENSORS
SEMESTER- VI

Type of course: Program Elective

Prerequisite: Basic Electrical Engineering

Rationale: The objective of this Course is to understand instrumentation, sensor theory and technology, data acquisition, digital signal processing, damage detection algorithm, life time analysis and decision making. This course introduces theoretical and practical principles of design of sensor systems. The topics include: transducer characteristics for acoustic, current, temperature, pressure, electric, magnetic, gravity, salinity, concentration of contaminants, velocity, heatflow, and optical devices, limitations on these devices imposed by building/structure/pavement environments, signal conditioning and recording, noise sensitivity and sampling limitations and standards. Lectures will cover the principles of state-of-the-art systems being used in physical infrastructure/bridges/buildings/pavements, etc.

Teaching and Examination Scheme:

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

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	**Module 1*: Fundamentals of Measurement, Sensing and Instrumentation*:** Definition of measurement and instrumentation, physical variables, common types of sensors; Describe the function of these sensors; Use appropriate terminology to discuss sensor applications and qualitatively interpret signals from a known sensor type, types of instrumentation, Sensor Specifics, Permanent installations, Temporary installations.	10	25%
2	**Module 2*: Sensor Installation and Operations*** : Predict the response of sensors to various inputs, Construct a conceptual instrumentation and monitoring program, Describe the order and methodology for sensor installation, Differentiate between types of sensors and their modes of operation and measurement ,Approach to Planning and Monitoring Programs, Define target, Sensor selection, Sensor siting, Sensor Installation &Configuration, Sensor design, Measurement uncertainty.	15	30%
3	**Module 3*: Data Analysis and Interpretation*** : Fundamental statistical concepts, Data reduction and interpretation, Piezometer, Inclinometer, Strain gauge, etc. Time domain signal processing, Discrete signals, Signals and noise and a few examples of statistical information to calculate Average value (mean), standard deviation, median, mode, range.	10	25%

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| 4 | **Module 4**: *Frequency Domain Signal Processing and Analysis* : Explain the need for frequency domain analysis and its principles, Draw conclusions about physical processes based on analysis of sensor data, Combine signals in a meaningful way to gain deeper insight into physical phenomena, Basic concepts in frequency domain signal processing and analysis, Fourier Transform, FFT (Fast Fourier Transform), Example problems: Noise reduction with filters, Leakage, Frequency resolution. Case Study. | 10 | 20% |

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
15 %	**15 %**	**20 %**	**20%**	**15 %**	**15 %**

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 .Alan S Morris (2001), Measurement and Instrumentation Principles, 3rd/e, Butterworth   Hienemann

2. David A. Bell (2007), Electronic Instrumentation and Measurements 2nd/e, Oxford Press

3. S. Tumanski (2006), Principle of Electrical Measurement, Taylor & Francis

4. Ilya Gertsbakh (2010), Measurement Theory for Engineers, Springer

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

Sr. No.	Course Outcome	Weightage
CO-1	Specify the requirements in the calibration of sensors and instruments	25%
CO-2	Suggest proper sensor technologies for specific applications	35%
CO-3	Design and set up measurement systems and do the studies	20%
CO-4	Analyze the errors during measurements	20%

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GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3160620

List of Experiments:

1. Instrumentation of typical civil engineering members/structures/structural elements
2. Use of different sensors, strain gauges, inclinometers and their performance characteristics
3. Errors during the measurement process
4. Calibration of measuring sensors and instruments
5. Measurement of noise
6. Analog Signal processing
7. Digital Signal Processing
8. Demonstration & use of sensor technologies

GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Civil and Infrastructure Engineering
Subject Code: 3164009
Semester – VI
Subject Name: Remote Sensing and GIS

Type of course: Open Elective

Prerequisite: Knowledge of Surveying

Rationale: To impart the knowledge of applications of Remote Sensing and GIS for decision making, planning and disaster management.

Teaching and Examination Scheme:

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

Content:

Sr. No.	Content	Total Hrs
1	**Remote Sensing:** Concept of remote sensing, Definition of remote sensing, remote sensing process, source of energy, energy interaction in atmosphere, energy interaction with earth surface, interpretation and analysis, analog (visual) image interpretation, digital image processing, process of remote sensing data analysis. Data acquisition, various remote sensing platforms, satellites, sensors, multi spectral scanners, microwave sensing, spatial and spectral resolutions. **Applications of Remote Sensing:** Application of remote sensing Land cover and land use, agriculture application, forestry application, hydrology, oceans and coastal monitoring, environmental impact assessment.	**10**
2	**GIS:** Cartography, Geographic mapping process, transformations, map projections, Geographic Data Representation, Spatial and Non-spatial data, Storage, Quality and Standards, database management systems, Raster data representation, Vector data representation, GIS Data Processing, Analysis and Modelling Raster based GIS data processing – Vector based GIS data processing – Queries – Spatial analysis – Descriptive statistics – Spatial autocorrelation – Quadrant counts, and nearest neighbour analysis – Network analysis –	**10**

		Surface modelling – DEM and DTM. **Applications of GIS:** Decision making, Cartography, Environment, Transportation, Highway Management, Managing Water Resources, Integrated Land Management, Real Estate Transaction, Land Survey, Utilities Management, Disaster Warning and Management System, Physical Development, Organization of Capitals and Cities.	
	3	**GPS**: Basic concepts, components, factors affecting, GPS setup, accessories, segments satellites & receivers, GPS applications, Case studies. Applications of remote sensing, GIS and GPS, Engineering applications, land use/land cover mapping, applications to urban and regional planning, Water resources, environmental studies, transportation engineering, other civil engineering fields.	**8**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
0	**25**	**25**	**20**	**20**	**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. Lo, C. P. &Yeung A. K. W., "Concepts and Techniques of Geographic Information Systems", Prentice Hall of India, New Delhi, 2002.

2. Anji Reddy, M., "Remote Sensing and Geographical Information Systems", B.S. Publications, Hyderabad, 2001.

3. Burrough, P.A., "Principles of Geographical Information Systems", Oxford Publication, 1998.

4. Clarke, K., Getting Started with Geographic Information Systems, Prentice Hall, New Jersy, 2001.

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5. De Mers, M. N., "Fundamentals of Geographic information Systems", John Wiley & Sons, New York, 2000.

6. Kennedy M., "The Global Positioning System & GIS: An Introduction", Ann Arbor Press, 1996.

7. Basudeb Bhatia; "Remote Sensing and GIS"; Second Edition; Oxford University Press (ISBN: 9780198072393)

8. Cristopher D. Lloyd; "Spatial Data Analysis (An Intro for GIS Users)"; Oxford University Press (ISBN: 978-0-19-955432-4)

9. Lillesand, T. M., Kiefer R. W. and Chipman, J. W. "Remote Sensing and Image Interpretation", 5th Edition, John Wiley and Sons India.

Course Outcomes: After studying this subject, students will be able to

Sr. No.	CO statement	Marks % weightage
CO-1	Understand remote sensing, various platforms, satellites, sensors.	10
CO-2	Apply concepts of remote sensing in vrous fields	35
CO-3	Comprehend GIS, raster data and vector data, DEM, DTM, and its applications	35
CO-4	Understand concepts of GPS and apply it in various fields	20

Software Based Practical:

- Introduction to GIS software

- Dataset sources and importing files to GIS

- Digitization of map in GIS

- Contour maps using GIS

- Contour maps using Google Earth

- Create maps in GIS

- Image Classification in GIS

- False color composite using GIS

- DEM creation in GIS

- Georeferencing in GIS

Major Equipment:

Computers with higher configuration and internet, server.

List of Open Source Software/learning website:

☐ Cad drafting tools, Google earth (free ware)

☐ Google SketchUp Pro for Nonprofits
(https://www.google.com/earth/outreach/grants/software/sketchup.html)

☐ Remote Sensing & Geographic Information System (http://gis.nic.in/)

☐ National Remote Sensing Centre (http://www.nrsc.gov.in/)

☐ Indian Space Research Organisation (http://www.isro.org/)

☐ Indian institute of Remote Sensing (http://www.iirs.gov.in/)

☐ List of geographic information systems software
(http://en.wikipedia.org/wiki/List_of_geographic_information_systems_software)

☐ Google books on GIS and Remote Sensing
(https://www.google.co.in/search?q=Urban+Planning+Techniques&btnG=Search+Books&tbm=bks&tbo=1&gws_rd=ssl#q=GIS+Remote+Sensing&tbm=bks)

GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Civil and Infrastructure Engineering
Subject Code: 3164010
Semester – VI
Subject Name: Water and Waste Water Engineering

Type of course: Professional Elective Course

Prerequisite: Study of Environmental Science, Environmental Sustainability, Green Chemistry and Environmental Technology

Rationale: The water is basic requirement for humans and should be available in pure and potable form to keep the community away from waterborne diseases and treatment of wastewater is absolutely needed to protect the health of people.

Teaching and Examination Scheme:

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

Content:

Sr. No.	Content	Total Hrs.
1	**Water treatment plant**: Layout plan and section of water treatment plant, Estimation of raw water discharge for treatment plant, Design period and factors considered for selection of design period. Treatment plant site selection, factors considered, future stages of expansion, selection of treatment train. **Collection and conveyance of raw water from source**: Intakes, types of intakes, conveyance of water, design of pumps and gravity and rising mains	12
2	**Water treatment processes and treatment units**: Plain sedimentation, aeration, sedimentation tank & its design, sedimentation with coagulation, types of coagulants, optimum dose of coagulants, mixing devices, design of flocculation unit. theory of filtration, types of filters and their comparison, design of rapid sand filter, washing of filter, methods of disinfection, methods of removing hardness Computation of dose of chemicals for removal of hardness	8
3	**Distribution system**: Layouts of distribution networks, Components of distribution system, Newton's and Hardy cross methods for network analysis, storage capacity of ESR and underground reservoir, determination of location and height of ESR. **Collection of sewage & estimation of its discharge:** Different types of sewers, sewerage systems, variation in sewage flow, sewer appurtenance, estimation of wastewater discharge in a sewer in sewerage system, estimation of storm water discharge in urban area, separate and combined sewerage systems, laying and testing of sewers.	8

4	**Unit operations/ processes for wastewater treatment**: Layout plan and section of municipal wastewater treatment plant, Physical unit operation screening, flow equalization, mixing, flocculation, sedimentation. Chemical unit processes-chemical precipitation. Biological unit processes: Aerobic attached growth and aerobic suspended growth treatment processes, anaerobic suspended growth treatment processes, an aerobic suspended growth treatment processes, low cost sanitation systems, septic tanks, soak pit, stabilization ponds.	8
5	**Design of wastewater treatment units**: Design of racks, screens, grit chamber, aeration units, primary & secondary clarifiers, activated sludge plant and trickling filter units, rotating biological contactors, sludge dewatering units, sludge digesters and drying beds.	6

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
40	**20**	**20**	**10**	**5**	**5**

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

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

Reference Books:

1. Environmental engineering volume 1 and 2 by S.K.Garg, Khanna publisher
2. Environmental engineering volume 1 and 2 by B.C.Punamia, laxmi publication
3. Environmental engineering volume 1 and 2 by Dr.P.M.Modi
4. Water supply and sanitary engineering by G.S.Birdie and J.S.Birdie
5. Environmental pollution engineering by C.S. Rao wiley eastern
6. Water supply and wastewater engineering by B.S.N Raju, Tata McGraw hill, New Delhi
7. H.S. Peavy, D.R.Row & G.Tchobanoglous, environmental engineering,Mc Graw Hill Intranational Edition
8. Viesman, Hammer and Chadik, water supply and pollution control, PHI Publication.
9. M.L.Devis and D.A.Cornwell,Introdution to environmental engineering:-2nd edition-1997,Mc Graw Hill Intranational Edition
10. Metcalf and eddy,(revised by G.Tchobanoglous) Wastewater Engineering:Treatment,disposal reuse,Tata-Mc Graw Hill,New Delhi
11. Waste water treatment plants, Planning Design and Operation, Syed Qasim, CRC Press.
12. Water Works Engineering: Planning, Design and Operation, Syed R. Qasim, Edward M. Motley, Guang Zhu, CRC Press

Course Outcomes:

After learning the course the students will be able to

Sr. No.	CO statement	Marks % weightage
CO-1	Design the water supply system	40
CO-2	Design of waste water treatment systems	40
CO-3	Determine the treatment efficiency of treatment unit	20

GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Civil and Infrastructure Engineering
Subject Code: 3164010

List of Experiments:

- Introduction to standards, collection and preservation of samples, sampling techniques and laboratory equipment
- Determination of turbidity and jar test
- Determination of DO and BOD
- Determination of COD
- Treatability study of domestic wastewater
- Determination of langelier's saturation index
- Determination of dose of chemicals for removal of hardness of given water sample

Major Equipment:

- BOD incubator
- COD Apparatus
- Jar test Apparatus
- Auto zero set Burette
- Digital DO meter
- Top Loading Electronic balance
- Aerator

List of Open Source Software/learning website:

Epanet, relevant websites of IIT's

GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Civil & Infrastructure Engineering

Subject Code: 3164011
Semester – VI
Subject Name: Design of Concrete and Masonry Structures

Type of course: Professional Core Subject

Prerequisite: Mechanics of solid, Fundamentals of Structural Analysis, Concrete Technology.

Rationale: Design of Concrete Structures subject provides conceptual understanding and applications of design of concrete structures. With the help of this knowledge students may be able:

1. To understand the general mechanical behavior of reinforced concrete as composite material.
2. To analyze and design reinforced concrete structural members subjected to bending/flexural, compression, shear and torsional stress.
3. To design reinforced concrete slabs, beams, columns, stairs, footings and retaining walls.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
4	0	2	5	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	**Introduction to Concrete Design** Design requirements: strength, stiffness, stability, serviceability Design process: analysis, design and detailing Design philosophy: working stress method, Limit state method, Ultimate stress method.	05
2	**Basics of Concrete Structure Design:** Stress-strain relation of concrete, Assumptions -- Role of reinforcement – Bond between steel and concrete – Development of micro-crack and formation of isolated cracks. Limit state of collapse & serviceability, partial safety factors for material & loading. Limit State of Flexure: Stress-strain characteristics of concrete & reinforcing steel, Type of section-under reinforced, over reinforced & balance section, Neutral Axis depth, Moment of Resistance for singly reinforced, doubly reinforced and flanged sections. Limit State of Shear and Torsion, combined flexure & torsion, Bond & Anchorage, Development length, splicing.	10

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3	**Limit State Design of RC Elements:**	25
	Design of beams: Simply supported, cantilever and continuous beams	
	Design of columns: Classifications, Assumptions, Design of Short Columns under axial loading, uniaxial and biaxial bending	
	Design of slabs: One way & Two way slab and continuous slabs	
	Design of staircases.	
	Design of Foundations: Design of isolated footing under axial load and uni-axial bending, combined footing	
	Design of retaining walls	
4	**Design of Masonry Structures:** Introduction to Earthquake Resistant Features of unreinforced & reinforced masonry Structure (IS 4326), Basic structural behavior; Good construction practice, design of unreinforced masonry elements, Structural Use of Unreinforced Masonry (IS 1905), Design of two storeyed masonry buildings.	08

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
05	**15**	**30**	**20**	**10**	**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] S. U. Pillai and D. Menon, Reinforced Concrete Design, Tata McGraw-Hill 3rd edition, 2009.
[2] P. C. Varghese, Limit State Design of Reinforced Concrete, Prentice Hall India, 2008.
[3] S. N. Sinha, Reinforced Concrete Design, Tata McGraw-Hill, 2nd Edition, 2002.
[4] Nilson A H and Winter G, Design of Concrete Structures, Tata McGraw-Hill
[5] Ferguson P M, Bren J E and Jirsa J O, Reinforced Concrete Fundamentals, John Wiley and Sons, NewYork.
[6] M. L. Gambhir, Fundamentals of Reinforced Concrete Design, Prentice Hall India, 2006.
[7] A. K. Jain, Reinforced concrete: Limit state design, Nem Chand and Bros. 1999.
[8] J. Macgregor and J. K. Wight, Reinforced Concrete: Mechanics and Design, Prentice Hall, 5th edition, 2008.
[9] R. Park and T. Paulay, Reinforced Concrete Structures, John Wiley and Sons, 1975.
[10] Shah & Karve; Limit State Theory & Design of Reinforced Concrete; Structure Pub.,Pune.
[11] Dr. H.J. Shah; Reinforced concrete Vol-I; Charotar Pub. Anand.
[12] IS: 456 - Code of practice for plain and reinforced concrete.
[13] IS: 875 (Part I to V) - Code of practice for structural safety of Buildings Loading standards.
[14] Building Code Requirements for Masonry Structures (TMS 502-08/ACI 530-08/ASCE 5-08).

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Bachelor of Civil & Infrastructure Engineering

Subject Code: 3164011

[15] Specifications for Masonry Structures (ACI 530.1-08/ASCE 6-08/TMS 602-08) and Commentary.
[16] K S Jagadish, Structural Masonry, I K International Publishing House, New Delhi.

Course Outcomes:

At the end of the program students will be able to

Sr. No.	CO statement	Marks % weightage
CO-1	Understand various design philosophy and processes to be used in the reinforced concrete structures	10 %
CO-2	Justify reinforced concrete element requirements satisfying limit state of collapse and serviceability	20 %
CO-3	Design of various reinforced concrete elements such as beam, slab, column, stairs, foundation and retaining wall as per IS codal provisions and guidelines.	55 %
CO-4	Design of masonry buildings as per IS codal provisions and guidelines.	15 %

List of Software Based Practical

- Introduction and Overview of Structural Analysis and Design software

- Introduction to GUI of Software

- Creating New Project and Importing files and Generation of Models in Software

- Support, Load, Section and Member property specifications in Software

- Analysis and Design of Beams

- Analysis and Design of Slabs

- Analysis and Design of Columns

- Analysis and Design of Foundations

- Analysis and Design of Multistorey Framed structure

- Planning of Masonry House in Drafting Software and Design of Structure

Term-Work:

The student will have to carry out analysis and design a RCC or Masonry Building, which should include various types of structural components. Using the techniques, skills, and modern engineering software tools such as industry software STAAD Pro, ETAB etc. selected structure should be analysis and designed as per IS codes and report should be prepared. The students have to draw detailing of full design problems in A2 size drawing sheet and sketches of various structural components with proper detailing in sketch book/A3 size sheet from remaining topics of the syllabus.

Design based problem/ Open ended problem may also considered as a part of Term-work
A group of students has to undertake one open ended problem/design problem. Few examples of the same are given below:
1. Development of spread sheets for design of various structural elements like beam, column, slab, foundation etc.
2. Design of any one RCC or masonry structure from the course using any open-source / professional software and/or self-developed spread sheet/programs.
3. Site visit related to construction stages and report preparation

Practical examinations shall consist of oral based on term work and above course.

List of Open Source Software/learning website:
1. http://nptel.ac.in
2. www.elearning.vtu.ac.in
3. www.gsdma.org
4. www.nicee.org

GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Civil and Infrastructure Engineering
Subject Code: 3164012
Semester – VI
Subject Name: Infrastructure Planning and Appraisal

Type of course: Professional Core Subject

Prerequisite: NIL

Rationale:

Infrastructure Planning and Appraisal is providing conceptual understanding of variables involve in planning and evaluation of infrastructure projects. With the help of this knowledge students may be able:

- To provide an overview of Infrastructure scenario in India and their sector specific features
- To provide required knowledge and skills planning and appraising sustainable civil Infrastructure systems and their interactions
- To make student aware of the procurement management process involved in the infrastructure projects

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	PA(M)	Viva	PA (I)	
3	1	0	4	70	30	0	0	100

Contents:

Sr. No	Topics	Hrs.
1	**Introduction:** Infrastructure scenario in India: Sector wise details, infrastructure players, key issues and government initiatives in transport, power, telecom, urban and rural infrastructure sectors	8
2	**Infrastructure Project Planning:** Players in Infrastructure, Long term planning issues of infrastructure projects, Infrastructure planning process, Multi-criteria analysis for comparison of infrastructure alternatives; Infrastructure delivery methods including PPP, Infrastrucre economics and financial models, Life cycle costing, Project structuring, Project Risks, Risk allocation and management, Integration of infrastructure systems	15
3	**Infrastructure Project Appraisal**: Demand Analysis & Forecasting, Technical Analysis, Economic and Financial Analysis, Environmental Clearance Procedure in India, Environment Impact Assessment: Purpose & Process, EIA Hierarchy, Impact Indicators	10
4	**Infrastructure Project Management:** Project governance, Project management planning and control systems, Stake holder management, Legal and contractual	6

	issues, Procurement of infrastructure provider: process, pricing and negotiation, MIS for infrastructure projects	

Course Outcomes: After successful completion of the course the students will be able to:

Sr. No.	CO statement	Marks % weightage
CO-1	Understand about the key infrastructure sectors and their related planning and management issues	30 %
CO-2	Appraising an infrastructure project based on demand, technical and economic point of view	50 %
CO-3	Know about the management process involved in the procurement of infrastructure projects	20 %

Reference Books:

1. James Parkin, D. Sharma, Infrastructure Planningg, Thomas Telford, 1999
2. W. Ronald Hudson, Waheed Uddin, Ralph C. Haas, Infrastructure Management: Integrating Design, Construction, Maintenance, Rehabilitation and Renovation, McGraw-Hill Professional, 1997.
3. S. Goodman and M. Hastak, Infrastructure planning handbook: Planning, engineering, and economics, McGraw-Hill, New York, 2006.
4. J. D. Finnerty, Project financing - Asset-based financial engineering, John Wiley & Sons, New York, 1996.
5. Rajarshi Majumder, Infrastructure and Development in India, Interlinkages and Policy Issues, Rawat Publications, 2008.
6. P. Chandra, Projects: Planning, analysis, selection, financing, implementation, and review, Tata McGraw-Hill, New Delhi, 2009

List of Tutorials:

- Infrastructure sector survey
- Time Value of Money
- Formulate five infrastructure business cases
- Identify major factors governing the choice of selection along with their weightage
- Do multi criteria decision analysis for ranking the project proposals
- Do locational analysis for the shortlisted project proposal
- Do the demand analysis for the proposed project & identify the revenue stream
- Do the technical analysis to identify the cost input for the proposed project
- Do the financial analysis
- Propose a contract model for procuring the infrastructure

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
25	**25**	**20**	**15**	**15**	**0**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above

List of Open Source Software/learning website: www.nptel.iitm.ac.in/courses/

GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Civil and Infrastructure Engineering
Subject Code: 3164013
Semester – VI
Subject Name: Railway and Bridge Engineering

Type of course: Professional Elective Course

Prerequisite: Basics of Civil Engineering

Rationale:
Railway and Bridge Engineering is conceptual understanding of transportation infrastructure. Railways play vital role in development of a nation by economic surface transportation of passengers and freight for the longer distances. Rail network is important part of transportation infrastructure in the country. For the Civil Engineers it is necessary to have the knowledge about railway tracks, its components, geometric design, turn-outs, crossings, signals and control, stations, yards and safety aspects. The bridges are also important on road or railway network to provide continuous passage over openings like river, sea, valley, road or rail. Bridge sub-structure and super structure components, hydraulic design, standard loading specifications, and structural health monitoring are important aspects to incorporate for thorough understanding of the subject.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	1	0	4	70	30	0	0	100

Content:

Sr. No.	Content	Total Hrs
1	**Indian Railway:** History, recent developments, gauges in Indian and other railways, gauge conversion issues. **Engineering Surveys for railway lines:** Alignment of railway lines, preliminary investigations for a new railway line, and types of surveys.	2
2	**Rail tracks and Components:** **Rails:** Functions, types of rails, standard rail sections, materials, properties, forces acting on track, resistance of traction, stress in rails, creep of rail, defects and failure of rails, rail flaw detection. **Sleeper:** Functions, requirements, materials used for sleepers, types of sleepers, density and spacing of sleepers **Ballast:** Function, types of ballast, aggregates used of track ballast, specifications of track ballast. **Fittings and fastening**: Function, requirement of track fittings, rail to rail fastening, fittings for sleepers, testing of fastening, rails joint and welding of rails. **Subgrade and formation:** Slopes of formation, execution of earthwork in embankments	5

	and cuttings, blanket and blanketing material, failure of railway embankment.	
3	**Geometric design of railway track:** Necessity for geometric design, details of geometric design of track, gradients, grade compensation on curves, Points and crossings, track junction and track layout. **Railway Stations and yards:** Purpose of a Railway Station, Selection of Site for a Railway Station, Facilities Required at Railway Stations, Requirements of a Passenger Station Yard, Classification of Railway Stations, Station Platforms, Types of Yards, Catch Sidings and Ship Sidings. **Signalling and Interlocking**: Objectives of Signalling, classification of signals, Signalling system, Interlocking. **Tunneling:** Underground railway, Necessity of tunnels, Methods of tunneling in soft ground and in hard rocks, TBM, Mucking, Lining, Ventilation and Drainage in tunnels. **Impacts** on surroundings due to change in existing track alignment and due to new construction of railway track.	14
4	**Introduction of Bridges:** Definition, components of a bridge, importance of bridge, classification of bridges based on structural behaviour and materials, **Bridge components:** superstructure, bridge piers, abutments, wing walls, bridge foundations, bridge joints and bearings. **Engineering feasibility studies for bridges:** Need for investigations, selection of bridge site, preliminary data to be collected, design discharge and its determination, linear waterway, economical span, vertical clearance above HFL, afflux, scour depth, choice of bridge type. **Standard Specifications:** Standard specifications for road bridges, types of loadings, code provisions on width of carriage way, clearances, loads considered etc. Standard specifications for railway bridges, Railway bridge code, Design aspects.	16
5	**Structural Health Monitoring of Bridges:** Introduction to health monitoring of bridges. Monitoring Techniques such as visual Inspection, NDT Test, Static load testing, Dynamic load testing etc. Repair and retrofitting measures.	5
	Total	42

Suggested Specification table with Marks (Theory):

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

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

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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. S.C. Saxena and S. P. Arora, A Text Book of Railway Engineering, Dhanpat Rai & Sons, New Delhi

2. S.P. Bindra, Principles and Practice of Bridge Engineering, Dhanpat Rai & Sons, New Delhi

3. Chandra S. & Agrawal M M., ""Railway Engineering." Oxford University Press, New Delhi, 2007.

4. Victor D J., "Essentials of Bridge Engineering" Oxford and IBH Publishers, New Delhi, 2003.

5. Vazirani & Ratwani, "Design of Concrete Bridges, Khanna Publishers, New Delhi, 1986.

6. Ponnuswamy S., "Bridge Engineering" Tata McGraw Hill, New Delhi, 2003.

7. Raina V. K., "Field Manual for Highway and Bridge Engineers", Shroff Publishers and Distributors Pvt. Ltd, 2009 (3rd Edition)

8. Raina V. K., "Concrete Bridge Practice: Construction, Maintenance and Rehabilitation"

9. Raina V. K., "Concrete Bridges: Inspection, Repair, Strengthening, Testing & Load Capacity Evaluation"

10. Helmut Wenzel, "Health Monitoring of Bridges" Wiley Publications,

Course Outcomes: After study of this subject students will be able to

Sr. No.	CO statement	Marks % weightage
CO-1	Understand railway infrastructure, components and planning.	25
CO-2	Design geometrics of railway tracks and associated components	25
CO-3	Decide guiding parameters of bridge planning and design	20
CO-4	Carry out bridge hydraulic design and able to judge the health monitoring criteria of bridges.	30

List of Tutorials:

- Investigation of preliminary surveys for railways
- Geometric design of railway tracks
- Determination of sleeper density
- Field visit for understanding track components
- Various Methods of Maintenance of railway tracks
- Feasibility assessment of construction of bridge
- Study of codal provisions of bridges
- Hydraulic design of bridges
- Repair and retrofitting of railway and bridge components
- Case study of railway and bridges planning & construction

Major Equipment: Nil

List of Open Source Software/learning website:

www.nptel.iitm.ac.in/courses/

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be presented and put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide.

GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Civil and Infrastructure Engineering
Subject Code: 3164014
Semester – VI
Subject Name: Construction Project Planning and Management

Type of Course: Professional Elective Course

Prerequisite: NIL

Course Objectives: students may be able:

1. To make students aware of construction project environment and the construction project management process in general.
2. To impart knowledge on methods and tools necessary for planning, scheduling, monitoring and control of construction projects.
3. To impart the basic training on the professional software applications in project planning, scheduling and control

Teaching and Examination Scheme

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

Course Contents

Sr.No.	Topics	Hrs.
1	**Introduction to Construction Management**: Constriction projects & their features, Purpose and functions of construction management, Construction management process & scope, Construction project life cycle, Construction project organisations, Project Team and their roles, Relevance of construction management in project success.	4
2	**Introduction to Construction Project Planning:** Project Execution Plan, Projects scope definition, Project Organisation & Responsibility Matrix, Work Breakdown structure (WBS), Planning & Scheduling inputs/data, Tools for project scheduling: Bar charts, Network diagrams, LOB method.	8
3	**Project Scheduling & Monitoring using CPM:** AOA and AON Networks, Event time/Activity time calculations, Critical activities and critical paths, Activity floats, Time grid diagrams & resource allocation, Project updating, Time-cost optimization of networks, Cost control and monitoring using CPM networks, Network based Time & Cost variance analysis/Earned Value Analysis	17
4	**Advanced Networks and Scheduling Concepts/Tools**: PERT Network Analysis, Precedence Network Analysis, Line of Balance Methods	7
5	**Introduction to Software for Project Planning & Scheduling:** MS PROJECT/PRIMAVERA	6
	Total	**42**

Text Book(s)

Sharma, M.R., Fundamnetals of Construction Planning and Management, S.K. Kataria& Son, New Delhi, 2012

Reference Book(s)

1. Seetharaman, S., Construction Engineering & Management, Umesh Publications, 2007.
2. Srinath, L.S., PERT & CPM Principles and Applications, Tata McGraw Hill, New Delhi.
3. Peurifoy, L., Schexnayder, C.J. and Shapira, A., Construction Planning, Equipment and Methods, McGraw Hill, New Delhi, 8th Edition, 2010.
4. Punamia, B.C. and Khandelwal, K.K., Project Planning and Control with PERT and CPM, Laxmi Publications, New Delhi, 2004.
5. Gahlot, P.S. and Dhir, B.M., Construction Planning & Management, New Age International (P) Ltd., New Delhi
6. Chitkara, K. K., Construction Project Management Planning, Scheduling and Controlling, Tata McGraw Hill, New Delhi.

Course Outcomes: After successful completion of the course the students shall be able to:

Sr. No.	CO statement	Marks % weightage
CO-1	Demonstrate an understanding on the planning, scheduling and control processes involved in civil construction projects	20 %
CO-2	Use the tools and methods applied for the planning, scheduling and control of civil construction projects	60 %
CO-3	Prepare time, cost and other resource plans and schedules of civil construction projects using software	20 %

Software based List of Practical

- Work breakdown structure (WBS) & Enterprise Breakdown Structure (EPS), Organizational Breakdown Structure (OBS)
- Development of Activity, logical Relationship
- Advanced Scheduling using Leap & Lag
- Bar charts
- CPM network developments (AOA & AON)
- CPM network analysis (Event times/activity times/floats)
- Create Calendar & Assign it in Project
- Resource Creation & Allocation
- Resource Levelling in Project
- Baseline Schedule in Project
- Project Monitoring & Updating
- Project crashing (time-cost optimization)
- Earned value analysis
- PERT network analysis
- PD network analysis

Suggested Specification table with Marks (Theory):

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

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above

List of Open Source Software/learning website: www.nptel.iitm.ac.in/courses/

GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Civil and Infrastructure Engineering
Subject Code: 3164015
Semester – VI
Subject Name: Design of Electrical and Mechanical Systems for Building

Type of course: Professional Elective Course

Prerequisite: Infrastructure Utilities

Rationale: Design of Electrical and Mechanical Systems for building is used to establish the general guidelines for sizing and designing the adequate utilities according to type of building. With the help of this knowledge students may be able to:

1. Understand the needs of different utilities/systems in civil infrastructure
2. Sizing and designing adequate electrical and mechanical utilities according to building type
3. To be Familiar about economic aspects and overall safety for different system used in buildings

Teaching and Examination Scheme:

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

Content:

Sr. No.	Content	Total Hrs
1	**Introduction of Building Services:** Energy distribution, Energy supply (gas, electricity and renewable sources such as solar, wind, geothermal and biomass), Escalators and lifts, Facade engineering (such as building shading requirements), Fire safety, detection and protection, Heating, ventilation and air conditioning (HVAC), Information and communications technology (ICT) networks, Lighting (natural and artificial), Lightning protection, Refrigeration, Security and alarm systems, Water, drainage and plumbing	6
2	**Psychrometric and Building Cooling and Heating Load Analysis:** Thermal Comfort, Psychrometry, Properties of Moist air, Psychrometric properties and Processes for various region, Space heat gain, Space Cooling load, Cooling load general design guidelines for buildings **Sizing and Design of Air-Conditioning system for Buildings/Industrial premises:** Air conditioning systems and applications, System Selection based on building requirement, Economic Evaluation **Mechanical Ventilation of Buildings:** Indoor Air Quality, Natural Ventilation vs. Infiltration, Air Distribution patters, Duct System types for buildings, Basic principles of Air flow in Ducts, Duct sizing, Duct deign methods,	15
3	**Electrical Safety Management** : Electric Shock, need of Earthing, different methods of Earthing, factors affecting the Earth Resistance, methods of measuring the Earth Resistance, Equipment Earthing and System Grounding, Earthing Procedure -Building installation, Domestic appliances, Location of lightening arrester with reasons	11

	Protective Elements : Fuse, MCB, ELCB **Electric supply system**: Electric Services for Multi-storied Buildings Generator, UPS, Conductors, Insulations, Sub-station Layout Electric Solar panel installation, Micro grid, House wiring design, Green building, Smart metering	
4	**Electrical Lighting, Cooling and Heating systems** : **Illumination**: Nature of light, visibility spectrum curve of relative sensitivity of human eye and wave length of light, Different type of lamps, General ideas bout street lighting, flood lighting, monument lighting and decorative lighting, light characteristics etc., LED **Cooling**: Principle of air conditioning, vapour pressure, refrigeration cycle, eco-friendly refrigerants, Description of Electrical circuit used in refrigerator, air conditioner and water cooler **Heating**: Advantages of electrical heating, Heating methods	10

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**20**	**30**	**15**	**15**	**10**

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

Reference Books:

1. Ahmadul Ameen, Refrigeration and Air Conditioning, Publisher: Prentice-hall of India
2. Walter T. Grondzik, Alison G. Kwok, Mechanical and Electrical Equipment for Buildings, Publisher: John Wiley & Sons.
3. Rao, S., "Testing, commissioning, operation and maintenance of electrical equipment", 6/E., Khanna Publishers, New Delh
4. S. Sivanagaruju, "Generation and Utilization of Electrical Energy", Pearson
5. H.Partap, "Art and Science of Utilization of Electrical Energy", Dhanpat Rai & Sons
6. J. B.Gupta, "Utilization of Electrical Energy", Kataria Publications

Course Outcomes: After studying this subject, students will be able to

Sr. No.	CO statement	Marks % weightage
CO-1	Know and understand the different mechanical utilities and systems for the building	15
CO-2	Sizing and designing adequate mechanical utilities in civil infrastructure	35
CO-3	Know various electrical utility requirements in Building	30
CO-4	Understand about electrical safety	20

List of Experiments :

- Measurement of Earth resistance by use of Earth Tester by three -point method or fall potential test
- Measurement of Soil resistivity for domestic and commercial load.
- To observe short circuit and open circuit analysis (Winding, Cables and Wiring) on the body of electrical equipment
- Temperature controlled Alarm system (using 2 NTC)
- Model development of house wiring
- Water level control circuit
- Home Automation and protection system using IOT
- Experimental validation of IV curve for series and parallel connected PV modules
- Cooling load calculations for various types buildings.
- Sizing and designing of cooling system for the building
- Sizing and designing of air distribution duct

List of Tutorials

- Study on various mechanical systems for residential and commercial buildings
- Study of fire-fighting systems requirement according to building types
- Different types of ventilation system used for commercial buildings
- Advanced mechanical appendages to large scale commercial projects
-

Major Equipments:

- Megger: Insulation Tester
- Earth resistance tester
- Relay (5v)
- Heater (resistive in nature)
- NTC thermistor 10k
- Potentiometer (10k)
- MCB
- ELCB
- Aurdino/uno
- Motion detector Sensor
- Relays for connecting home appliances,
- Electromechanically controlled doors or windows,
- PV cell
- POT Meter

List of Open Source Software/learning website: www.nptel.iitm.ac.in/courses/

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GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code:3164016

Semester – VI
Subject Name: Design of Foundations

Type of course: Professional Elective Course

Prerequisite: Soil Mechanics, Mechanics of Solids

Rationale:
Foundation design provides conceptual understanding of application of principles of soil mechanics in foundation design. Any civil engineering structure needs strong and stable foundation which depends on proper understanding of soil behaviour, determination and interpretation of soil parameter. This subject will enable the students to examine the site condition and prepare and interpret the bore log data. Student will also be able to design foundation under different loadings for different soil conditions.

Teaching and Examination Scheme:

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

Content:

Sr. No.	Content	Hrs.
1	**Soil Exploration and Geophysical Investigation** Objectives of soil exploration, methods of exploration, soil samples and soil samplers, field penetration tests, Bore log and report writing, data interpretation, Introduction to geophysical methods.	6
2	**Foundation : An Introduction** Functions of foundations. Requisites of suitable foundations. Different types of foundations. Factor affecting the selection of type of foundation. Advantages and limitations of various types of foundations. Footings subjected to eccentric loading. Conventional procedure for proportioning footings for equal settlements. Supports for shallow and deep excavations. Stress distribution in sheeting and bracing of shallow and deep excavations. Stability of bottom of excavations.	8
3	**Shallow foundations** Bearing capacity of shallow foundation on homogeneous deposits, Bearing capacity from in-situ tests, Seismic considerations in bearing capacity evaluation. Codal provisions to determine bearing, Settlement of foundations and Codal provisions, Methods to enhance bearing capacity and minimizing total and differential settlements.	10
4	**Pile and deep foundations** Classification of piles, Load carrying capacity, Group action and pile spacing. . Load carrying capacity and settlement of piles group. Static and dynamic formulae. Pile capacity by penetration tests and pile load tests (IS methods). Interpretation of pile load test (routine	12

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	test), Negative skin friction and its consideration in design. Under reamed piles, compaction piles. Caissons and piers: Open (well) caissons. Box (floating) caissons. Pneumatic caissons. Construction details and design considerations of well foundations. Drilled piers and their construction details	
5	**Machine Foundation** Types of machine and suitable foundations, Soil dynamic parameters, Resonance and frequency ratio, design criteria for machine foundation, Block type machine foundation, Principles of Design of Foundations for reciprocating and impact machines as per IS code.	6

Suggested Specification table with Marks (Theory):

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

Venktatramaiah, C. Geotechnical Engineering, New Age International.

Ranjan and Rao; Basic and Applied Soil Mechanics; New Age International Publishers

Bowles J. E., Foundation Analysis and Design. 1997, the McGraw-Hill Companies, Singapore.

Das B. M., Principles of Foundation engineering", PWS Publishing Company.

Braja M. Das, Principles of Soils Dynamics, McGraw Hill, 1992.

Shamsher Prakash et al, Analysis, Design of foundations and Retaining Structures Sarita Prakashan.

Tomlinson, F. Design and Const., 6th Edition, Longman Pub., 1995.

Swami Saran, Soil Dynamics and Machine Foundation, Galgotia publications Pvt. Ltd., New Delhi 1999.

Poulos, H.G., Davis, E.H., Pile foundation analysis and design, John Wiley and Sons, New York, 1980.

Murthy, V.N.S. "Advanced Foundation Engineering", CBS Publishers and Distributors

Course Outcomes:

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Sr. No.	CO statement	Marks % weightage
CO-1	Select appropriate soil investigation/testing technique/method and get true sub soil parameters used for selection of type of foundation as per Codal guidelines.	20
CO-2	Select and design appropriate/suitable foundation system (shallow/deep) for different structures, that satisfy the allowable bearing capacity and settlement requirements based on soil properties,	30
CO-3	Design of shallow foundation satisfying bearing capacity and settlement requirement	30
CO-4	Design of deep foundation and understanding of Codal provisions	20

Term-Work

The students will have to solve at least five examples and related theory from each topic as an assignment/tutorial. Practical examinations shall consist of oral based on term-work and above course.

List of Practical:
- Standard Penetration Test
- Plate load test
- Auger Boring
- Laboratory California bearing ratio test
- Field California bearing ratio test
- Field Vane Shear Test
- Laboratory Vane Shear Test
- Cone penetration testing

List of Open Source Software/learning website:
https://nptel.ac.in/courses/105108069/
https://nptel.ac.in/courses/105/106/105106144/
https://www.cedengineering.com/userfiles/Geotechnical%20Engineering%20-%20Shallow%20Foundations.pdf
https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-361-advanced-soil-mechanics-fall-2004/lecture-notes/
https://law.resource.org/pub/bd/bnbc.2012/gov.bd.bnbc.2012.06.03.pdf

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GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Civil and Infrastructure Engineering
Subject Code: 3164017
Semester – VI
Subject Name: Urban Transport System Planning

Type of course: Professional Elective Course

Prerequisite: Highway and Traffic Engineering

Rationale:
Efficient urban mass transportation system is the prime need of today's life. Well planned road/railway network and reliable mass transportation systems are necessary to cater the increased need of the passengers and goods trips within urban as well as suburban area. Safe, economic, timely and comfortable urban mass transportation systems can reduce private vehicle trips, which ultimately reduce traffic congestion, accidents and environmental pollution. Study of this subject imparts knowledge of urbanization process, urban transportation system planning, land use planning, travel demand modeling procedure, different urban mass transportation systems and urban goods movement.

Teaching and Examination Scheme:

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

Content:

Sr. No.	Content	Total Hrs
1	**Introduction:** Urbanization, problems in transportation, urban transportation system planning process.	4
2	**Urban Mass Transportation Systems:** Types, public, private and para-transit systems, their capacities and suitability, need of coordination	6
3	**Travel Demand Modelling:** Land use planning, traffic analysis zones, types of trips, Trip generation analysis: Home interview and road side interview survey, regression and category analysis. Trip distribution analysis: O-D matrix, Growth factor methods, Gravity model, opportunity model Modal split analysis: Trip-end type and trip-interchange type models, RP and SP survey, Probit and Logit models Trip assignment analysis: route choice behavior, diversion curves, shortest path algorithms, All-Or-Nothing assignment, capacity restraint models, static and dynamic	18

		models	
4	**Introduction to routing and scheduling:** Problems in routing and scheduling of urban mass transit systems, transit system's performance parameters. Procedure in urban mass transit infrastructure planning, construction and maintenance, impact analysis and economic evaluation.		10
5	Urban goods movement, TSM (Transportation System Management) techniques, ITS applications.		4

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**15**	**20**	**30**	**15**	**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. B.G.Hutchinson, Principles of urban transportation system planning- McGraw-Hill, New York, 1974
2. Edward K.Morlok, Transportation Engg. and Planning
3. W.Dickey, Metropolitan Transportation Planning Tata McGraw-Hill, New Delhi, 1975
4. Blunder and Black, Land useTtransportation System
5. J.Ortuzer and L.G. Willumsen, Modelling Transport, Johan Wiley and Sons Chincester,1994
6. Vukan R. Vuchic, Urban Transit : Operations, Planning and Economics, Wiley Sons Publishers.
7. Peter White, Public Transport, UCL Press
8. Kadiyali L.R., Traffic Engineering and Transport Planning, Khanna Publishers
9. Khisty, C J., Transportation Engineering – An Introduction, Prentice-Hall, NJ
10. S.C. Saxena, Traffic Planning and Design, Dhanpat Rai Pub., New Delhi.
11. Partho Chakraborty and Animesh Das, Principles of Transportation Engineering, PHI
12. C. S. Papacostas, Fundamentals of Transportation System Analysis, PHI.
13. James H. Banks, Introduction to Transportation Engineering, WCB-McGraw Hill, New York

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

Sr. No.	CO statement	Marks % weightage
CO-1	Understand urbanization, its problems and different urban mass transportation systems	20
CO-2	Carry out travel demand modelling analysis	40

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CO-3	Analyse routing-scheduling of urban mass transportation systems, suggest suitable transportation system management techniques and understand urban goods movement	30
CO-4	Know about the procedure involved in urban mass transit infrastructure planning, construction and maintenance	10

List of Practical:
- Conducting Home Interview Survey of selected area
- Computer analysis of collected House Hold Data
  - Trip generation analysis: Linear Regression and Cross Category analysis.
  - Trip distribution analysis: Growth Factor Methods, Gravity Model.
  - Desire line diagram preparation
  - Modal split analysis.
  - Trip assignment: Shortest path analysis and network-assignment.
- Conducting RP/SP Survey
  - Computer analysis of collected data for mode choice analysis
- Conducting Boarding-Alighting survey of passengers on selected route of Mass Transit System
  - Computer analysis of collected data
- Investigating Routing and Scheduling of existing Mass Transit System
  - Computer application for solving the Routing and Scheduling problems.
- Conducting survey for Urban Goods movement
  - Computer analysis of collected data

Major Equipment: Nil

Field work: Collection of Home – Interview data. Presentation with group discussion on its analysis and interpretations.
Field Visit: Visit to Urban Mass Transportation System Service - Depot, Terminals, Offices, Construction site.

List of Open Source Software/learning website:

http://nptel.ac.in/courses/105107067/30

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