



GANDHINAGAR INSTITUTE OF TECHNOLOGY

Gandhinagar University

Academic Regulation & Curriculum

for

B.Tech in Civil Engineering

w.e.f. 2026-27

Preamble

The Department of Civil Engineering, Gandhinagar Institute of Technology, Gandhinagar University, is committed to fostering academic excellence, professional ethics, applied research, sustainable infrastructure development, and industry-oriented learning in the broad field of Civil Engineering. The B.Tech Civil Engineering programme is framed to prepare technically competent, socially responsible, and innovation-driven civil engineers who can contribute to the planning, analysis, design, construction, operation, maintenance, and rehabilitation of infrastructure systems.

The programme is intended to remain aligned with AICTE guidelines, NEP 2020, Outcome-Based Education (OBE), and Choice-Based Credit System (CBCS) principles. The academic structure encourages flexibility, multidisciplinary exposure, hands-on learning, use of modern engineering tools, and continuous improvement through feedback from students, alumni, industry, academic experts, and other stakeholders.

Civil Engineering plays a foundational role in national development through buildings, bridges, roads, rail and metro systems, water supply networks, wastewater treatment systems, irrigation structures, smart cities, environmental protection systems, disaster-resilient infrastructure, and sustainable construction practices. The department shall therefore focus on balancing core engineering fundamentals with modern practices such as Building Information Modelling (BIM), geospatial technology, sustainable construction materials, structural health monitoring, digital project management, climate-resilient infrastructure, and AI-assisted analysis and decision-making.

The curriculum and academic delivery shall integrate classroom instruction, laboratory experimentation, fieldwork, construction site visits, design exercises, consultancy exposure, internships, live projects, research activities, and technical communication. The department shall strive to develop graduates capable of critical thinking, ethical decision-making, teamwork, leadership, lifelong learning, and problem solving for the built and natural environment.

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1. Institutional Vision and Mission

1.1 Vision

To create a flexible and learner-focused engineering ecosystem that builds strong technical skills, practical knowledge, and innovative thinking, preparing graduates to adapt, perform, and lead in a rapidly evolving technological and societal environment.

1.2 Mission

To provide a holistic learning environment that develops technically skilled, innovative, and socially responsible engineers capable of addressing industrial, technological, and societal needs.

2. Departmental Vision and Mission

2.1 Vision

To impart outcome-based Civil Engineering education that develops professionally competent, ethically grounded, environmentally conscious, and innovation-oriented civil engineers capable of contributing to sustainable infrastructure development and societal well-being.

2.2 Mission

- To provide strong foundations in civil engineering science, design, construction practices, and modern infrastructure technologies.
- To develop practical competency through laboratories, field surveys, site visits, internships, live projects, software training, and industry interaction.
- To inculcate professional ethics, safety culture, environmental responsibility, teamwork, communication skills, and lifelong learning.
- To encourage research, consultancy, entrepreneurship, innovation, and problem solving in structural, geotechnical, transportation, environmental, water resources, construction management, and allied civil engineering domains.

3. Programme Educational Objectives

The Programme Educational Objectives (PEOs) describe the expected accomplishments of Civil Engineering graduates a few years after completion of the programme.

PEO 1: To equip Civil Engineering students with essential knowledge of mathematics, basic sciences, engineering fundamentals, and core civil engineering principles.

PEO 2: To develop the ability to analyse, design, construct, manage, maintain, and improve civil infrastructure systems using appropriate codes, standards, field data, laboratory results, and modern engineering tools.

PEO 3: To sensitize students toward societal needs, environmental sustainability, disaster resilience, public safety, professional ethics, and responsible use of resources in civil engineering practice.

PEO 4: To prepare students for careers in industry, government, consultancy, research and development, higher education, entrepreneurship, and socially relevant infrastructure development.

4. Programme Details

4.1 Programme Structure and Duration

- **Programme Name:** Bachelor of Technology in Civil Engineering
- **Duration:** 4 Years
- **Semesters:** 8
- **Mode:** Full Time
- **Intake:** 120 Seats
- **Credit Structure:** As per NEP / University norms and approved curriculum
- **Medium of Instruction:** English
- Lateral Entry / D2D admissions, wherever applicable, shall be governed by ACPC, University, and statutory norms.

4.2 Eligibility Criteria for Admission

Candidates who have passed the Higher Secondary Examination (10+2) or equivalent examination from a recognized board with Physics, Chemistry, and Mathematics or other approved subject combination as prescribed by the competent authority shall be eligible for admission, subject to a 50% aggregate marks (45% for reserved category candidates as per applicable norms) as prescribed by ACPC, Gandhinagar University, AICTE, and applicable statutory norms.

For lateral entry / Diploma to Degree admission, eligibility shall be as per the prevailing rules of ACPC, Gandhinagar University, and applicable statutory authorities.

4.3 Admission Procedure

Admission to the B.Tech Civil Engineering programme may be granted through the Admission Committee for Professional Courses (ACPC), Government of Gujarat, based on prevailing admission norms, or through the direct admission process conducted by the University as per applicable rules, eligibility criteria, seat availability, and statutory guidelines.

4.4 Credit Summary

The credit distribution which is finalized as per the approved Civil Engineering curriculum under NEP / University norms are mentioned below:

Disciplines	Percentage	1st Yr	2nd Yr	3rd Yr	4th Yr	Total Credits
Core Engineering	54%	8	32	39	16	95
Humanities	6%	8	2	0	0	10
Basic Science	10%	14	4	0	0	18
Engineering Science (Minor)	8%	12	0	0	0	12
Multidisciplinary (open elective)	5%	4	2	3	0	9
IKS	5%	2	2	2	2	8
Projects / Training / Seminar	12%	0	0	0	22	22
Total	100%	48	42	44	40	174

5. Curriculum Structure

Institute Name (Code): Gandhinagar Institute of Technology (01)								GU Batch V-Year - 2026-27				
Program Name (Code): Bachelor of Technology (01)								Branch Name (Code): CL (002)				
Semester/Year : I/I								Effective in Academic Year - 2026-27 (July - Dec)				
Subject Code	Course Type	Subject Name	Credit	Hours per week				Theory (Marks)		Practical (Marks)		Total (Marks)
				L	T	P	Total	University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
10000101	Basic Science	Engineering Mathematics-I	5	3	2	0	5	70	30	0	0	100
10010104	Professional Core	Engineering Drawing Practice	4	3	0	2	5	70	30	30	20	150
10010106	Professional Core	Fundamentals of Mechanical Engg.	4	3	0	2	5	70	30	30	20	150
10010105	Engineering Science	Engineering Foundation	4	3	0	2	5	70	30	30	20	150
SEC014	SEC-I	Introduction to Cyber Security	2	2	0	0	2	25	25	0	0	50
VAC014	VAC-I	Integrated Personality Development Course	2	2	0	0	2	25	25	0	0	50
AEC002	AEC-I	Communication and Presentation for Technical Professional	2	2	0	0	2	25	25	0	0	50
Total			23	18	2	6	26					700

Institute Name (Code): Gandhinagar Institute of Technology (01)								GU Batch V-Year - 2026-27				
Program Name (Code): Bachelor of Technology (01)								Branch Name (Code): CL (002)				
Semester/Year :II/I								Effective in Academic Year - 2026-27 (Jan - June)				
Subject Code	Course Type	Subject Name	Credit	Hours per week				Theory (Marks)		Practical (Marks)		Total (Marks)
				L	T	P	Total	University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
10000201	Basic Science	Engineering Mathematics-II	5	4	1	0	5	70	30	0	0	100
10030101	Professional Core	Basics of Electrical & Electronics Engg.	4	3	0	2	5	70	30	30	20	150
10020102	Professional Core	Fundamental of Civil Engg.	4	3	0	2	5	70	30	30	20	150
10000004	Basic Science	Engineering Physics	4	3	0	2	5	70	30	30	20	150
AEC015	AEC-II	Personality Development for Effective Leadership	2	2	0	0	2	25	25	0	0	50
VAC021	VAC-II	Stress and Time Management	2	2	0	0	2	25	25	0	0	50
SEC019	SEC-II	Social Media Management	2	2	0	0	2	25	25	0	0	50
IKS0201	IKS	Indian Ancient History and Cultural Heritage	2	1	0	2	3	0	25	25	0	50
		Total	25	20	1	8	29					750

Institute Name (Code): Gandhinagar Institute of Technology (01)								GU Batch V -Year - 2027-28				
Program Name (Code): Bachelor of Technology (01)								Branch Name (Code): CL (002)				
Semester/Year :III/II								Effective in Academic Year - 2027-28 (July-Dec)				
Subject Code	Course Type	Subject Name	Credit	Hours per week				Theory (Marks)		Practical (Marks)		Total (Marks)
				L	T	P	Total	University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
10000303	Basic Science	Statistics and Partial Differential Equations	4	3	1	0	4	70	30	0	0	100
VAC023	VAC-III	Universal Human Values	2	2	0	0	2	25	25	0	0	50
10020303	Professional Core	Fluid Mechanics	4	3	0	2	5	70	30	30	20	150
10020305	Professional Core	Mechanics of Solids	4	3	0	2	5	70	30	30	20	150
10020306	Professional Core	Concrete Materials and Technology	4	3	0	2	5	70	30	30	20	150
10020307	Professional Core	Surveying	4	3	0	2	5	70	30	30	20	150
		Total	22	17	1	8	26					750

Gandhinagar Institute of Technology (01)												
Institute Name (Code): Gandhinagar Institute of Technology (01)								GU Batch V -Year - 2027-28				
Course Name (Code): Bachelor of Technology (01)								Branch Name (Code): CL (002)				
Semester/Year :IV/II								Effective in Academic Year - 2027-28 (Jan-June)				
Subject Code	Course Type	Subject Name	Credit	Hours per week				Theory (Marks)		Practical (Marks)		Total (Marks)
				L	T	P	Total	University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
10020406	Professional Core	Building Planning	4	2	0	4	6	70	30	30	20	150
10020407	Professional Core	Geotechnical & Applied Geology	4	3	0	2	5	70	30	30	20	150
10020408	Professional Core	Building Construction	4	3	0	2	5	70	30	30	20	150
10020409	Professional Core	Theory of Structures-I	4	3	1	0	4	70	30	0	0	100
SEC026	SEC-III	Cyber Security	2	2	0	0	2	25	25	0	0	50
IKS0403	IKS	Vedic-Mathematics	2	2	0	0	2	0	50	0	0	50
		Total	20	15	1	8	24					650

Institute Name (Code): Gandhinagar Institute of Technology (01)								GU Batch V -Year - 2028-29				
Course Name (Code): Bachelor of Technology (01)								Branch Name (Code): CL (002)				
Semester/Year :V/III								Effective in Academic Year - 2028-29 (July - Dec)				
Subject Code	Course Type	Subject Name	Credit	Hours per week				Theory (Marks)		Practical (Marks)		Total (Marks)
				L	T	P	Total	University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
10020503	Professional Core	Highway Engineering	4	3	0	2	5	70	30	30	20	150
10020509	Professional Core	Soil Mechanics	4	3	0	2	5	70	30	30	20	150
10020510	Professional Core	Construction Planning Management and Equipment	3	3	0	0	3	70	30	0	0	100
10020511	Professional Core	Theory of Structures-II	4	3	1	0	4	70	30	0	0	100
	Open Elective-I	Open Elective-I	3	2	1	0	3	70	30	0	0	100
	Program Elective-I	Elective-I	4	3	1	0	4	70	30	0	0	100
		Total	22	17	3	4	24					700
Open Elective - I			Program Elective-I (4-3-1-0)									
10020512	Disaster Management in Civil Infrastructure		10020508	Remote Sensing and GIS								
10020513	Building Services		10020515	Railway, Airport, and Harbour Engineering								
10020514	Sustainable Smart Cities		10020516	Advance Construction Technology								
			10020517	Sustainable Building Technology								

Institute Name (Code): Gandhinagar Institute of Technology (01)								GU Batch V -Year - 2024-25				
Course Name (Code): Bachelor of Technology (01)								Branch Name (Code): CL (002)				
Semester/Year :VI/III								Effective in Academic Year - 2026-27(Jan-June)				
Subject Code	Course Type	Subject Name	Credit	Hours per week Theory				(Marks)		Practical (Marks)		Total (Marks)
				L	T	P	Total	University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
10020603	Professional Core	Traffic Engineering	4	3	0	2	5	70	30	30	20	150
10020609	Professional Core	Engineering Hydrology and Water Resources	4	3	0	2	5	70	30	30	20	150
10020610	Professional Core	Environmental Technology	4	3	0	2	5	70	30	30	20	150
10020611	Professional Core	Structural Design- I	4	3	1	0	4	70	30	0	0	100
	Program Elective-II	Elective-II	4	3	0	2	5	70	30	30	20	150
IKS0601	IKS	Minor Project on IKS	2	0	0	4	4	0	0	0	50	50
		Total	22	15	1	12	28					750
Program Elective-II (4-3-0-2)												
10020608	Foundation Engineering											
10020612	Advanced Fluid Mechanics											
10020613	Advanced Concrete Technology											
10020614	Air and Noise Pollution											

6. Teaching, Learning and Evaluation

6.1 Teaching Methodology

The programme shall adopt a student-centric and outcome-oriented teaching-learning approach. The department shall ensure that theory, practical, field, design, and project components are aligned with Course Outcomes, Programme Outcomes, and Programme Educational Objectives.

- Classroom teaching and interactive lectures
- Problem-solving sessions and tutorial-based learning
- Case studies related to infrastructure projects, failures, innovations, and best practices
- Laboratory experimentation in civil engineering laboratories
- Surveying, mapping, levelling, and field measurement exercises
- Construction site visits and infrastructure exposure visits
- Industry interaction, expert lectures, workshops, and technical training
- Design-based learning using codes, standards, drawings, and software tools
- GIS, remote sensing, AutoCAD, STAAD.Pro, ETABS, Revit, BIM, MS Project, Primavera, and other relevant software training, as available
- Research projects, innovation activities, consultancy-linked assignments, and live projects
- Internships, field training, community-based projects, and experiential learning
- AI-based learning tools, virtual laboratories, digital platforms, and blended learning

6.2 Attendance Rules

- Minimum 75 percent attendance shall be mandatory in each course unless revised by university regulations.
- Students below the prescribed attendance requirement may not be permitted to appear in the any examination.
- Additional attendance requirements may apply for practical courses, fieldwork, survey camps, internships, workshops, seminars, site visits, and project work.

- The department shall maintain attendance records and communicate attendance status to students as per institutional practice.

6.3 Examination and Evaluation System

The evaluation system shall consist of Continuous Internal Evaluation (CIE), Mid-Semester Examination, End-Semester Examination (ESE), practical evaluation, viva voce, fieldwork assessment, seminar evaluation, project evaluation, and internship assessment, wherever applicable.

Evaluation Components

- Mid-Semester Examination
- Assignments and design problems
- Class tests and quizzes
- Laboratory records, practical performance, and viva voce
- Fieldwork, site visit reports, survey records, and measurement books, wherever applicable
- Presentations, technical reports, posters, and case studies
- Mini projects, research assignments, and innovation activities
- AI-enabled quizzes and digital learning assessments, where appropriate
- Internship, seminar, minor project, and major project evaluation

6.4 Weightage

The evaluation weightage shall be as per Gandhinagar University norms. Unless modified by competent authority, the general evaluation pattern may be followed as under:

- **Continuous Internal Evaluation:** 33 percent
- **Mid-Semester Examination:** 20 percent
- **End-Semester Examination:** 47 percent

For practical, project, seminar, internship, studio, and field courses, the assessment distribution shall be as prescribed in the approved curriculum and University examination rules.

6.5 Passing Standards

A student shall be declared to have successfully passed a course subject to fulfilling the minimum passing criteria prescribed by the University from time to time. The passing criteria for the B.Tech Civil Engineering programme shall generally include the following, unless otherwise revised by the University:

- Minimum prescribed marks in the End-Semester Examination, wherever applicable.
- Minimum prescribed aggregate marks considering all evaluation components including continuous internal evaluation and end-semester examination.
- Separate passing criteria may be applicable for theory, practical, laboratory, fieldwork, workshop, project, seminar, and internship components.
- Students must fulfil academic, practical, attendance, fieldwork, safety, documentation, and evaluation requirements for successful completion of each course and the programme.
- The University reserves the right to revise the evaluation and passing criteria from time to time as per academic regulations and statutory guidelines.

6.6 Grading System

The programme shall follow Gandhinagar University grading norms. The indicative grade table is given below and shall remain subject to revision by the University.

Grade	Grade Points	From Marks	To Marks
AA	10	80	100
AB	9	73	79
BB	8	66	72
BC	7	60	65
CC	6	55	59

CD	5	50	54
DD	4	45	49
FF	0	0	44

6.7 Project Work / Dissertation / Seminar

Students shall undertake minor project, technical seminar, internship, major project, or industry-based project work as prescribed in the curriculum. Civil Engineering projects may be carried out in areas such as structural engineering, construction materials, transportation engineering, geotechnical engineering, water resources engineering, environmental engineering, construction management, sustainability, GIS, surveying, building planning, smart infrastructure, or interdisciplinary domains.

- Problem identification and proposal presentation
- Literature review, data collection, field investigation, or laboratory testing, wherever applicable
- Use of relevant codes, standards, design methods, software tools, and safety practices
- Periodic review by faculty guide / review committee
- Interim progress report and final report submission
- Presentation, demonstration, and viva voce examination
- Evaluation by internal and external examiners as per University norms

7. Rules and Regulations

7.1 Rules for Promotion

A student enrolled in the B.Tech Civil Engineering programme shall be promoted to subsequent semesters in accordance with the academic regulations and promotion rules prescribed by the University from time to time, subject to fulfilment of minimum attendance requirements, academic performance criteria, completion of prescribed credits, and compliance with examination rules.

7.2 Maximum Duration for Completion

The maximum duration for completion of the B.Tech Civil Engineering programme shall be eight academic years from the date of admission or as prescribed by the University and applicable regulatory authorities from time to time. For lateral entry students, the maximum duration shall be as prescribed by the University.

7.3 Internship Guidelines

Students shall undergo mandatory internship, industrial training, field training, or industry-oriented experiential learning as prescribed in the curriculum structure. The internship / training may be carried out in the following organizations or domains:

- Construction companies and infrastructure contractors
- Structural design consultancies and architectural-engineering firms
- Roads, bridges, highways, rail, metro, airport, and urban infrastructure projects
- Government departments, municipal corporations, development authorities, public works departments, and public sector undertakings
- Water supply, irrigation, wastewater treatment, solid waste management, and environmental engineering organizations
- Geotechnical investigation agencies and material testing laboratories
- Ready-mix concrete plants, cement industries, construction material industries, and quality control laboratories
- Real estate developers, project management consultants, and construction management organizations

- Surveying, GIS, remote sensing, BIM, and digital infrastructure service providers
- Research and development organizations, NGOs, startups, and MSMEs working in civil engineering and allied fields

Students shall submit the following documents and evaluation components after completion of internship / training:

- Internship / industrial training report
- Work diary / logbook / daily progress record
- Training completion certificate from the organization
- Presentation and viva voce
- Project, assignment, drawing, design, estimate, site report, or field report, wherever applicable
- Feedback from industry mentor / site supervisor, wherever available

7.4 Discipline Rules

Students shall maintain discipline, professional ethics, safety standards, and proper conduct within the institution, laboratories, drawing halls, workshops, construction sites, field visits, survey camps, internships, examinations, technical events, and all academic activities associated with the programme.

Students are expected to:

- Attend classes, laboratories, tutorials, fieldwork, and workshops regularly.
- Follow institutional rules, safety instructions, laboratory manuals, fieldwork procedures, and site-specific safety norms.
- Respect faculty members, staff, fellow students, industry mentors, site personnel, and institutional property.
- Maintain academic honesty and integrity in assignments, designs, drawings, practical work, field records, project reports, and examinations.
- Use laboratory equipment, surveying instruments, machines, tools, software, and field instruments responsibly and only under authorized supervision.
- Wear required safety gear during site visits, laboratory activities, and fieldwork wherever instructed.

Any form of misconduct, indiscipline, ragging, use of unfair means in examinations, damage to institutional property, harassment, unsafe laboratory practices, falsification of field or laboratory data, plagiarism, or behaviour affecting the academic environment shall be treated seriously and may result in disciplinary action as per University rules, AICTE norms, UGC regulations, and applicable laws.

7.5 Anti-Ragging Policy

The programme shall strictly comply with UGC Anti-Ragging Regulations, AICTE Anti-Ragging Guidelines, anti-ragging affidavit requirements, and institutional disciplinary procedures. Ragging in any form is strictly prohibited and shall invite strict disciplinary action as per applicable regulations.

7.6 Ethical Use of Technology and AI Tools

Students are encouraged to effectively utilize modern engineering software, digital tools, simulation platforms, geospatial tools, and AI-based technologies for learning, design, analysis, documentation, research, and innovation purposes.

Students may use the following tools, as available and relevant:

- CAD, drafting, and drawing software
- Structural analysis and design software
- BIM and digital construction platforms
- GIS, remote sensing, surveying, and mapping tools
- Construction planning, scheduling, estimation, and project management software
- Hydrology, hydraulics, environmental, and geotechnical analysis tools
- Programming, data analytics, and visualization tools
- AI-based learning platforms, virtual laboratories, and digital repositories
- The use of AI tools and digital technologies shall be ethical, responsible, transparent, and aligned with academic integrity. Students shall not engage in plagiarism, unauthorized copying, fabrication of data, false design calculations, misuse of AI-generated content, or submission of unverified content in assignments, projects, examinations, drawings, field records, laboratory records, or research work.

8. Student Support

8.1 Industry Collaboration

The department shall actively promote collaboration with construction companies, infrastructure firms, structural consultants, geotechnical agencies, transportation organizations, environmental engineering firms, water resources agencies, municipal bodies, public sector undertakings, material testing laboratories, ready-mix concrete plants, professional engineering bodies, and technology partners to enhance practical exposure and industry relevance of the B.Tech Civil Engineering programme.

Such collaborations may include:

- Industrial internships, field training, and construction site exposure
- Expert lectures, technical workshops, and software training
- Industrial visits, site visits, plant visits, and field demonstrations
- Live industry projects and consultancy-oriented assignments
- Joint research, innovation, and product development activities
- Skill development, safety training, and certification programmes
- Entrepreneurship, startup, and incubation support activities
- Placement and career development initiatives

The institution may establish Memoranda of Understanding (MoUs) with industries, government agencies, research organizations, professional bodies, and consultancy firms for academic enrichment, laboratory development, collaborative research, technology transfer, internship support, and industry-oriented learning.

8.2 Research and Consultancy

The department shall encourage faculty members and students to actively engage in research, innovation, consultancy, testing, design support, product development, and applied engineering studies related to civil engineering and allied domains.

Students may undertake:

- Research and innovation projects in civil engineering domains
- Laboratory testing and analysis of construction materials
- Concrete mix design, material characterization, and durability studies
- Structural analysis, design, retrofitting, and health monitoring studies
- Geotechnical investigations and soil testing studies
- Transportation, traffic, pavement, and highway studies
- Water, wastewater, hydrology, irrigation, and environmental studies
- GIS, surveying, mapping, and smart city related projects
- Sustainable construction, green building, and life cycle assessment studies
- Industry-oriented technical problem-solving assignments

The institution may undertake consultancy assignments for industries, government organizations, MSMEs, local bodies, and other agencies in areas such as material testing, concrete technology, structural design support, estimation and costing, survey work, traffic studies, environmental monitoring, water quality testing, geotechnical testing, project management, BIM modelling, and sustainability assessment, subject to institutional policy and availability of expertise and facilities.

Participation in conferences, technical competitions, workshops, publications, patents, funded projects, incubation activities, and collaborative research initiatives shall be encouraged to promote academic excellence, innovation, entrepreneurship, and industry-oriented learning.

8.3 Library and Laboratory Facilities

Adequate library, laboratory, field, workshop, computing, and digital learning facilities shall be made available to support effective teaching, practical training, research, innovation, and skill development under the B.Tech Civil Engineering programme.

The department shall facilitate access to:

- Civil engineering textbooks, reference books, manuals, and handbooks
- National and international journals, research publications, and e-resources
- Relevant codes, standards, specifications, and technical databases such as BIS and IRC, as available
- Digital learning platforms, virtual laboratories, simulation tools, and e-learning resources

- Surveying, geotechnical, concrete, transportation, environmental, hydraulics, structural engineering, and construction material laboratories, as available
- CAD, BIM, GIS, structural analysis, project management, and data analysis software facilities, as available
- Computing facilities, internet access, drawing facilities, model making, and field instruments required for practical and project-based learning
- Laboratories and field equipment shall be maintained with due attention to safety, calibration, standard operating procedures, record keeping, preventive maintenance, and responsible use by students and staff.

8.4 Student Support and Mentoring

A structured system for student support, academic mentoring, professional guidance, and personal counselling shall be implemented for students enrolled in the B.Tech Civil Engineering programme.

The department shall facilitate:

- Academic counselling and mentoring
- Attendance and performance monitoring
- Career guidance and higher education support
- GATE, GPSC, UPSC, and competitive examination guidance, wherever possible
- Technical skill development and software training activities
- Research, innovation, and entrepreneurship support
- Support for internships, industrial visits, technical competitions, and professional society activities
- Personal and professional development initiatives
- Necessary support mechanisms for addressing academic, personal, professional, and skill-related concerns shall be made available as per institutional policies.

8.5 Placement and Career Development

The department shall actively promote placement assistance and career development activities through industry interaction, internships, professional networking, campus engagement, expert sessions, and collaboration with the Training and Placement Cell.

Efforts shall be made to establish linkages with:

- Construction and infrastructure companies
- Structural design and project management consultancies
- Road, bridge, metro, rail, airport, and urban infrastructure organizations
- Water supply, wastewater, irrigation, and environmental engineering organizations
- Geotechnical investigation agencies and material testing laboratories
- Real estate, smart city, and urban development organizations
- Government departments, municipal bodies, public sector undertakings, and development authorities
- BIM, GIS, surveying, digital construction, and engineering service companies
- MSMEs, startups, NGOs, and social infrastructure organizations

Career development activities such as aptitude training, resume preparation, interview preparation, group discussion practice, soft skill development, technical certification programmes, entrepreneurship guidance, expert sessions, site safety training, software workshops, and placement-oriented training may be organized to enhance employability and professional competency.

9. Programme Credibility

9.1 Executive Summary

The B.Tech Civil Engineering programme is designed to develop industry-ready civil engineers with strong foundations in structural engineering, geotechnical engineering, transportation engineering, environmental engineering, water resources engineering, construction technology, surveying, project management, and sustainable infrastructure development.

The programme emphasizes balanced integration of theoretical knowledge, practical skills, field exposure, design capability, professional ethics, innovation, and research-oriented learning to prepare students for professional engineering practice, higher studies, entrepreneurship, government service, and multidisciplinary technological domains.

The teaching-learning process shall be supported through laboratories, fieldwork, surveying exercises, design assignments, software-based analysis, construction site visits, internships, project-based learning, industry interaction, and consultancy-linked exposure to ensure strong practical and application-oriented learning.

The programme shall promote the use of modern engineering tools, computational methods, GIS, BIM, digital construction technologies, sustainability assessment, AI-assisted learning, and data-driven decision-making to enhance technical competency and industry readiness among students.

Students shall be encouraged to participate in research activities, live projects, innovation challenges, technical competitions, internships, startup initiatives, professional society activities, and interdisciplinary projects to develop problem-solving abilities, creativity, leadership, teamwork, communication, and professional competency.

Graduates of the programme shall be academically and professionally prepared for careers in construction, infrastructure, structural design, geotechnical engineering, transportation, environmental engineering, water resources, project management, government departments, public sector organizations, consultancy, research, entrepreneurship, and higher education.

9.2 Scope and Career Opportunities

Graduates of the programme may find career opportunities in:

- Construction and infrastructure industries
- Structural engineering and design consultancies
- Transportation, highway, rail, metro, and airport projects
- Geotechnical engineering and foundation engineering organizations
- Environmental engineering, water supply, wastewater, and sanitation sectors
- Water resources, irrigation, hydrology, and drainage projects
- Urban development, smart city, and municipal infrastructure sectors
- Surveying, GIS, remote sensing, and geospatial technology organizations
- Ready-mix concrete, cement, construction materials, and quality control laboratories
- Real estate, project management, contracts, planning, and estimation organizations
- Government departments, public sector undertakings, and development authorities
- Research and development organizations, NGOs, startups, and social infrastructure initiatives

9.3 Potential Job Roles

Graduates of the programme may work in roles such as:

- Civil Site Engineer
- Structural Engineer / Structural Design Engineer
- Construction Project Engineer
- Planning Engineer
- Quantity Surveyor / Estimation Engineer
- Quality Assurance / Quality Control Engineer
- Geotechnical Engineer
- Transportation / Highway Engineer
- Environmental Engineer
- Water Resources / Irrigation Engineer
- Survey Engineer / GIS Engineer

- BIM Modeller / BIM Coordinator
- Materials Testing Engineer
- Contracts Engineer
- Municipal / Urban Infrastructure Engineer
- Safety Engineer in construction projects
- Research and Development Engineer
- Technical Consultant / Entrepreneur

9.4 Higher Study and Professional Opportunities

Students graduating from the B.Tech Civil Engineering programme may pursue:

- M.Tech / M.E. in Structural Engineering
- M.Tech / M.E. in Geotechnical Engineering
- M.Tech / M.E. in Transportation Engineering
- M.Tech / M.E. in Environmental Engineering
- M.Tech / M.E. in Water Resources / Hydraulics / Irrigation Engineering
- M.Tech / M.E. in Construction Engineering and Management
- MBA or specialized management programmes in project, construction, infrastructure, or real estate management
- Ph.D. in Civil Engineering and interdisciplinary domains
- Professional certifications in BIM, GIS, project management, safety, quantity surveying, sustainability, and green building systems
- GATE, GPSC, UPSC Engineering Services, public sector, and other competitive examinations
- Entrepreneurship and startup ventures in construction, consultancy, testing, GIS/BIM, sustainability, and infrastructure services

10. Collaborative Field Work / Experimental Work

The B.Tech Civil Engineering programme shall emphasize practical learning, field exposure, and application-oriented engineering education through collaborative fieldwork, laboratory practice, construction site exposure, internships, industrial training, and experimental learning activities.

Students may participate in:

- Survey camps, field surveys, levelling, traversing, mapping, and GIS-based exercises
- Construction site visits, building project exposure, infrastructure project exposure, and site safety observations
- Testing of cement, aggregates, concrete, bitumen, soil, water, and other construction materials
- Concrete mix design, durability studies, and sustainable construction material projects
- Transportation surveys, traffic volume studies, road safety studies, and pavement material testing
- Water quality analysis, wastewater treatment studies, environmental monitoring, and hydrology-related fieldwork
- Geotechnical investigations, soil classification, compaction, shear strength, and foundation-related studies
- Structural modelling, analysis, design, detailing, and retrofitting-related assignments
- BIM, CAD, GIS, project planning, estimation, and digital construction exercises
- Internship programmes, industry-oriented mini projects, and major project work in collaboration with industries, government agencies, and research organizations
- Community-based projects related to water, sanitation, waste management, drainage, sustainability, road safety, and rural or urban infrastructure improvement

The programme shall encourage experiential learning, problem-solving ability, teamwork, innovation, technical communication, professional ethics, and practical engineering competency aligned with modern civil engineering and infrastructure requirements.

11. Market Survey

11.1 Executive Summary

India continues to witness strong demand for civil engineering professionals due to infrastructure development, urbanization, affordable housing, industrial development, transportation networks, water and sanitation projects, renewable and sustainable infrastructure, and climate-resilient construction needs. Gujarat, including Ahmedabad and Gandhinagar, has a significant presence of construction industries, infrastructure projects, real estate development, roads and bridges, metro and urban mobility projects, water supply and environmental projects, industrial estates, and government-led urban development initiatives.

A Civil Engineering programme in this regional context is academically relevant and professionally important. Industry interactions generally emphasize the need for graduates with sound fundamentals, site exposure, knowledge of codes and specifications, proficiency in modern software, communication skills, project documentation ability, safety awareness, and practical understanding of quality control and construction management.

The programme should therefore focus on producing graduates who are competent in analysis, design, field practices, testing, estimation, planning, sustainability, digital construction, and professional conduct. Strong linkages with construction organizations, consulting firms, government departments, infrastructure agencies, and laboratories will improve employability and professional readiness.

11.2 Market Demand and Industry Trends

The Civil Engineering sector continues to be central to infrastructure growth, urban development, environmental management, and national economic development. Major growth and transformation areas include:

- Sustainable and green construction
- Smart cities and urban infrastructure
- Highways, bridges, rail, metro, airport, and logistics infrastructure
- Affordable housing and real estate development

- Water supply, wastewater treatment, sanitation, drainage, and environmental infrastructure
- Geotechnical investigation, ground improvement, and resilient foundation systems
- Retrofitting, repair, rehabilitation, and structural health monitoring
- BIM, digital construction, GIS, remote sensing, and data-driven infrastructure management
- Prefabrication, precast construction, modular construction, and rapid construction technologies
- Construction safety, project management, contracts, quality assurance, and cost control
- Climate-resilient infrastructure, disaster management, and sustainability assessment

Industries increasingly seek engineers with multidisciplinary skills, hands-on exposure, digital competency, safety awareness, communication skills, and innovation-oriented thinking aligned with modern infrastructure practices.

11.3 Skill Gap Identified by Industry

Industry feedback and market analysis commonly indicate the following skill gaps among civil engineering graduates:

- Limited site exposure and practical understanding of construction processes
- Insufficient proficiency in engineering drawing, detailing, estimation, and measurement practices
- Limited awareness of relevant codes, standards, specifications, and safety norms
- Lack of confidence in using software tools such as CAD, BIM, structural analysis, GIS, and project planning tools
- Weakness in documentation, technical reporting, communication, and presentation skills
- Limited exposure to quality control, material testing, and laboratory-to-field interpretation
- Insufficient understanding of contracts, planning, scheduling, billing, and project management practices
- Need for stronger awareness of sustainability, environmental compliance, disaster resilience, and ethical professional conduct
- The department shall address these gaps through practical learning, software training, site visits, laboratory exposure, internships, project-based learning, expert sessions, and collaboration with industry and government agencies.

11.4 Employment Opportunities and Industry Support

Graduates of the programme shall have employment opportunities in construction industries, infrastructure development firms, design consultancies, project management organizations, government departments, public sector undertakings, municipal bodies, transportation agencies, environmental firms, water resources organizations, geotechnical agencies, material testing laboratories, real estate firms, GIS/BIM service providers, MSMEs, startups, and research organizations.

Industries and agencies may support the programme through:

- Internships, field training, and construction site exposure
- Industrial visits, expert lectures, and field demonstrations
- Live projects, consultancy assignments, and problem-based learning
- Skill development initiatives, safety training, and software workshops
- Laboratory testing support, technical guidance, and collaborative research
- Placement assistance, career guidance, and professional networking

The programme is therefore expected to contribute toward developing industry-ready civil engineers equipped with modern technical knowledge, practical competency, ethical values, sustainability awareness, and professional skills.

12. Review and Revision of Regulation

The University reserves the right to interpret, modify, revise, amend, or update any provision, rule, regulation, curriculum structure, evaluation pattern, academic requirement, or operational guideline related to the B.Tech Civil Engineering programme from time to time in accordance with University regulations, statutory requirements, technological advancements, industry needs, accreditation requirements, and academic developments.

In case of any ambiguity or dispute regarding interpretation of any provision of this manual, the decision of the University or Competent Authority shall be final and binding on all stakeholders.

Any amendments, additions, or revisions approved by the appropriate academic or statutory bodies of the University shall automatically become applicable to the programme.

Annexure I: Detail Syllabus



GANDHINAGAR INSTITUTE OF TECHNOLOGY
B.TECH. 1st SEMESTER
ALL BRANCHES

DOC NO: 4061

Subject Code: 10000101	Subject Title: Engineering Mathematics-I
Pre-requisite: Nil	

Course Objective:

- To acquaint aspiring engineers with calculus, multivariate analysis and linear algebra techniques.
- To provide students with intermediate to advance level standard ideas and tools that will help them approach more challenging concepts and applications that they will find relevant in their fields.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
03	02	-	05	70	30	-	-	100

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Differential Calculus: Convergent sequence, Bounded sequence, Monotonic sequence, Infinite series, Geometric series, Telescoping series, Convergent, Divergent and Oscillatory Series, Cauchy's Fundamental test for Divergent, p-series, Comparison test, D'Alembert's Ratio test, Raabe's test, Gauss's test, Cauchy's Integral test, Cauchy's root test, Logarithmic test, De Morgan's and Bertrand's test, Cauchy's Condensation test, Alternating series, Leibniz's rule, Power series in x , Absolute and conditional convergence tests, Taylor's & Maclaurin's expansions of single variable, Indeterminate forms, Improper Integrals	12	25
2	Partial Differentiations: Limit and Continuity, Partial derivative, Implicit and Explicit functions, Euler's theorem, Geometrical interpretation of partial derivatives Application of Partial Differentiations: Tangent plane and Normal line, Maxima and Minima of functions of two variables, Lagrange's multiplier method, Jacobians	10	25
3	Vector Calculus: Vector and Scalar Fields, Gradient, curl and divergence, directional derivatives, Conservative fields, Line Integral, Work Done, Circulation and Flux, Green's Theorem	8	20



4	Multiple Integral: Double integral, change of order of integration, Application of Double Integral: Transformation of variables by Jacobian only for double integration, Change into polar co-ordinates in double integrals only, Triple integral, Applications of Integral: Change to spherical coordinates, Volume of a solid	8	20
5	Curve Tracing: Concavity, Curve Sketching, Relation between Polar Coordinates and Cartesian Coordinates, Graphs in Polar Coordinates	4	10

Course Outcome: After completion of this course, student will be able to

- Use Improper integral as a tool for differential and Integral calculus and understand the basic concepts of Indeterminate forms. Apply the various convergence tests to sequences, series and learning tools for power series in advanced engineering mathematics.
- Understand basic knowledge of partial derivatives and to compute extreme values of functions of several variables via partial derivatives, Tangent planes and Normal lines.
- Learn the basic concepts in vector calculus including gradient, directional derivatives, curl, work done, flux and Green's theorem.
- Gain the knowledge about solving double and triple integration to analyze engineering problems.
- Understand the geometrical terminology of cartesian and polar curves.

List of References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India Edition.
2. Peter O'Neill, Advanced Engineering Mathematics, 7th Edition, Cengage
3. James Stewart, Calculus: Early Transcendentals with Course Mate, 7e, Cengage, 2012.
4. T. M. Apostol, Calculus, Volumes 1 & 2,, Wiley Eastern.
5. Maurice D. Weir, Joel Hass, Thomas' Calculus, Early Transcendentals, 13e, Pearson, 2014
6. H.K.Dass, Advanced Engineering Mathematics, S. Chand.

Open e-Resource:

1. <https://nptel.ac.in/courses/111108098>
2. <https://nptel.ac.in/courses/111104125>
3. <https://nptel.ac.in/courses/111105121>



GANDHINAGAR UNIVERSITY

(Established and Incorporated Under Gujarat Private Universities Act 2009, Amendment: Guj. Act No. 7 of 2022)

GANDHINAGAR INSTITUTE OF TECHNOLOGY

B.TECH 1ST SEMESTER

MECHANICAL ENGINEERING / CIVIL ENGINEERING / ROBOTICS & AUTOMATION ENGINEERING

DOC NO: 4061

Subject Code: 10010104	Subject Title: Engineering Drawing Practice
Pre-requisite: Zeal to learn	

Course Objective:

- Demonstrate various graphical projections
- Improve analytical skills to understand design blueprints
- Improve skills to prepare designs blueprints for mechanical parts

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	0	2	4	70	30	30	20	150

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Engineering Curves: Classification and application of Engineering Curves, Construction of Conics, Cycloidal Curves, Involute and Spirals along with normal and tangent to each curve.	10	20
2	Orthographic Projections: Fundamental of projection along with classification, Projections from the pictorial view of the object on the principal planes for view from front, top and sides using first angle projection method and third angle projection method, full sectional view.	6 (Lab teaching)	15
3	Isometric Projections and Isometric View or Drawing: Isometric Scale, Conversion of orthographic views into isometric projection, isometric view or drawing of simple objects.	4 (Lab teaching)	10

4	Projections of Points and Lines: Introduction to principal planes of projections, Projections of the points located in same quadrant and different quadrants, Projections of line with its inclination to one reference plane and with two reference planes. True length and inclination with the reference planes.	8	15
5	Projections of Planes: Projections of planes (polygons, circle and ellipse) with its inclination to one reference plane and with two reference planes, Concept of auxiliary plane method for projections of the plane.	6	15
6	Projections of Solids, Section of Solids and Development of Surfaces: Classification of solids. Projections of solids (Cylinder, Cone, Pyramid and Prism) along with frustum with its inclination to one reference plane and with two reference planes, Section of such solids and the true shape of the section, Development of surfaces.	10	20
7	Computer Aided Drawing: Introduction to AutoCAD, Basic commands for 2D drawing like: Line, Circle, Polyline, Rectangle, Hatch, Fillet, Chamfer, Trim, Extend, Offset, Dim style, etc.	2 (Lab teaching)	5

Course Outcome: After completion of this course, student will be able to

- Know and understand the conventions and the methods of engineering drawing.
- Construct basic and intermediate geometry and comprehend the theory of projection.
- Improve their visualization skills so that they can apply these skills in developing new products.
- Improve their technical communication skill in the form of communicative drawings.
- Use computer software for engineering drawing.

List of References:

1. A Text Book of Engineering Graphics by P.J.Shah S.Chand & Company Ltd., New Delhi
2. Elementary Engineering Drawing by N.D.Bhatt Charotar Publishing House, Anand
3. A text book of Engineering Drawing by R.K.Dhawan, S.Chand & Company Ltd., New Delhi
4. A text book of Engineering Drawing by P.S.Gill, S.K.Kataria & sons, Delhi
5. Engineering Drawing by B. Agrawal and C M Agrawal, Tata McGraw Hill, New Delhi
6. Engineering Graphics by Arunoday Kumar, Tech knowledge Publications, Pune

Open e-Resource:

1. <https://nptel.ac.in/courses/112103019>
2. <https://nptel.ac.in/courses/112104172>
3. <https://archive.nptel.ac.in/courses/112/105/112105294/>



GANDHINAGAR UNIVERSITY

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List of Suggested Experiments:

Students must prepare sketch book and drawing sheets on the following topics. Minimum three problems must be given for sheet number 1 to 7.

1. Engineering curves
2. Projection of line
3. Projection of plane
4. Projection of solid, section of solid and development of surfaces
5. Orthographic projection
6. Isometric projection
7. At least one orthographic drawing (three views) using above mentioned AutoCAD commands.

Gandhinagar institute of Technology
B.Tech Mechanical Engineering (Offered in All programs)
Semester 1/2

Doc 4061

Subject Code: 10010105	Subject Title: Engineering Foundation
Pre-requisite:- Zeal to learn the subject	

Course Objective: p

- Acquire knowledge on different standards of length, calibration of End Bars, linear and angular measurements.
- Irrespective of branch, the use of workshop practices in day to day industrial as well domestic life helps to dissolve the problems
- Improve analytical skills to understand design blueprints
- Learn basic properties of materials and concepts of advanced manufacturing process
- Discover the root cause of a problem or event and fully understand how to fix, compensate or learn from any underlying issues within the root cause
- Provide the engineer a means of ensuring consistent design, quality and operating characteristics with adequate reliability and safety

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	0	2	4	70	30	30	20	150

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1.	Measurements: Introduction to Measurement, Definition, objectives and concept of Metrology, Need of inspection, Principles, process, methods of measurement, Classification and selection of measuring instruments and systems. Accuracy, precision and errors in measurement. System of measurement, Material Standard, Wavelength Standards, Subdivision of standards, Line and End standards, Classification of standards and Traceability, calibration of End bars, standardization.	08	20

	Slip gauges- Indian standards on slip gauge, method of selection of slip gauge, stack of slip gauge, adjustable slip gauge, wringing of slip gauge, care of slip gauge, slip gauge accessories, problems on building of slip gauges (M87, M112). Measurement of angles- sine bar, sine center, angle gauges, optical instruments for angular measurements		
2.	Engineering Workshop: Introduction, Safety slogans and rules in Mechanical workshop, Tools and Equipment used for safety in Mechanical workshop. Types of layouts, Rules and regulations for Workshop layouts and Preparation of actual layout. Introduction, Classification and characteristics of Engineering Materials, Tools and Equipment. *Demonstration of the operation performed on sheet metal for bending operation. Preparation of job in Drilling operation and demonstration on vertical drilling machine. Tools and Equipment for plumbing shop. Preparation of job in Plumbing for joining and threading operation. *Introduction to Arduino, components and working, Electronic circuit drawing, Electronic circuit on breadboard, Demonstration of Arduino for different configuration.	10	24
3.	Engineering Design: Introduction to Engineering Drawing and its significance, Drawing instruments and accessories, BIS – SP 46, Types of Lines and their Application, Lettering, Dimensioning Systems, Construction of Regular Polygons, Use of Plane Scales, Diagonal Scales and Representative Fraction.	10	24
4.	Engineering Materials: Types, properties and applications of Ferrous & Nonferrous metals, Timber, Abrasive material, silica, ceramics, glass, graphite, diamond, plastic and polymer Modeling, Simulation and Conceptual Prototyping: Concept of Modelling and Simulation, Goal of Modelling & simulation, Application of simulations, advantages and disadvantages of simulation, Introduction: Need for the compression in product development, history of RP systems, Survey of applications, Growth of RP industry, and classification of RP systems, FDM, SLS, SLA.	06	14
5.	Root Cause Analysis: Introduction, Complete Root Cause Analysis, QM & T Approach to Root Cause Analysis, Practical guide to carry out and RCA, RCA Tools & Techniques, Lookup Table for Completing an RCA, Examples, Hints & Tips, 12 Pitfalls of RCA	04	9
6.	Standards: Introduction, Basic Definitions, Requirements, Guidelines, History of Standards, Modern Examples, Conformity Assessment	04	9

*** - Topic will be covered during laboratory session**

Course Outcome: After completion of this course, student will be able to

1. Understand the objectives of metrology, methods of measurement, selection of measuring instruments, standards of measurement and calibration of end bars.
2. Students will learn about taking safety and precautionary measures of self and machines during operations.
3. Interpret engineering drawings using fundamental technical mathematics.
4. Interpret appropriate advanced material processing techniques for different requirement and application
5. Identify the breakdowns in processes and systems that contributed to event and how to prevent future events

List of References:

1. Elements of Workshop Technology: Vol- I and Vol - II”, K Hajra Choudhury, A K. Hajra, Media Promoters Pvt Ltd
2. Mechanical Measurement and Metrology by R K Jain, Khanna Publisher Mechanical Measurement & Control by D.S. Kumar.
3. A Text Book of Engineering Graphics by P.J.Shah S.Chand & Company Ltd., New Delhi
4. Modern Machining Processes, P. C. Pandey, H. S. Shan, Tata McGraw Hill
5. Root Cause Analysis - Improving Performance for Bottom-line Results, Robert J Latino, Kenneth C Latino, Taylor & Francis Group, CRC Press

Open e-Resource:

1. https://onlinecourses.swayam2.ac.in/aic22_ts42/preview
2. https://onlinecourses.nptel.ac.in/noc24_me123/preview

List of Suggested Experiments:

1. Introduction to Engineering workshop: working layout and safety.
2. Demonstration of the sheet metal bending operation and observe safety measures.
3. Demonstration of the drilling operation on vertical drilling machines and observe safety measures.
4. Demonstrate and understand the plumbing operation and tools in detail.
5. Demonstrate Arduino programming for different configurations.
6. Basic understanding of measurements and metrology: concepts, application, advantage and future aspects
7. Performance on linear and angular measurements and check different characteristics of measurements
8. Drawing Practice Sheet (which includes dimensioning methods, different types of line, construction of different polygon, divide the line and angle in parts, use of stencil)
9. Problems on Plane Scale.
10. Problems on Diagonal Scale.

11. Demonstration of prototype in FDM 3D Printing



GANDHINAGAR INSTITUTE OF TECHNOLOGY

B.TECH 1st SEMESTER

Civil Engineering / Mechanical Engineering/Robotics & Automation

DOC NO: 4061

Subject Code: 10010106	Subject Title: Fundamental of Mechanical Engineering
Pre-requisite: Zeal to learn	

Course Objective:

- To understand various fundamental thermodynamic laws
- To understand the concept of steam generation using various boilers
- To gain knowledge of Internal combustion engine
- To select drive and transmission element as per working condition
- To compare various Renewable energy sources with conventional energy sources

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	0	2	4	70	30	30	20	150

Subject Contents				
Sr. No	Topic	Total Hours	Weight (%)	
1	Laws of Thermodynamics- Concept of temperature, Zeroth law, principles of thermometry and temperature scale. First law of thermodynamics, second law of thermodynamics concept of internal energy, heat engines and thermal efficiency, types of system	6	9	
2	Introduction to IC Engines and Refrigeration and Air-conditioning: IC Engine: Basic Components, Construction and Working of Two stroke and four stroke SI & CI engine, merits and demerits, scavenging process; Introduction to electric, and hybrid electric vehicles. Refrigeration and Air-conditioning: Its meaning and application, unit of refrigeration; Coefficient of performance, VCR cycle, methods of refrigeration, construction and working of domestic refrigerator, concept of heat pump, construction and working of window air conditioner	13	24	
3	Couplings, Clutches and Brakes: Construction and applications of Couplings (Box; Flange; Pin type flexible; Universal and Oldham), Clutches (Disc and Centrifugal), and Brakes (Block; Shoe; Band and Disc)	7	12	



4	Non-Conventional Energy and their resources: Renewable and Non-renewable Energy Resources, Advantages and Disadvantages of Renewable Resources, Renewable Energy Forms and Conversion, Solar Energy, Wind Energy, Tidal Energy, Ocean Thermal Energy; Geothermal Energy, Nuclear Energy, Hydro Energy.	6	9
5	Mechanical Power Transmission: Belt Drives: Principle, working and Application of flat and V-belt drives.; Flat belt drives (Open and crossed), Simple numerical problems on flat belt drives involving velocity ratios (with effect of belt thickness and slip). Gear Drives: Classification of gear drives, Gear Trains and their application: simple and compound Gear Trains, Simple numerical problems on Gear trains involving velocity ratio Fundamentals of Mechanical Linkages: Definitions of Machines and Mechanisms. Applications of linear motion, oscillatory motion, and rotary motion Introduction to Robotics: Robot anatomy, Joints & links, common Robot configurations. Applications of Robotics	10	19
6	Steam Boiler: Steam formation, Classification of boiler, Cochran, Lancashire and Babcock and Wilcox boiler, Functioning of different mountings and accessories	Lab Hour	-

Course Outcome: After completion of this course, student will be able to

- To explain fundamental mechanical properties and thermodynamics laws.
- To identify and select various power transmission drives and mechanical linkages for required application.
- Discuss various power transmission elements with their applications
- To understand the basis for boilers and IC engine
- To explain need of energy conversion and various sources of Renewable energy

List of References:

1. Elements of Mechanical Engineering by N M Bhatt and J R Mehta, Mahajan Publishing House
2. Elements of Mechanical Engineering by P S Desai and S B Soni, Atul Prakashan
3. Basic Mechanical Engineering by Pravin Kumar, Pearson Education
4. Fundamental of Mechanical Engineering by G.S. Sawhney, PHI Publication New Delhi
5. Elements of Mechanical Engineering by Sadhu Singh, S. Chand Publication
6. Introduction to Engineering Materials by B.K. Agrawal, McGraw Hill Publication, New Delhi

**Open e-Resource:**

1. <https://nptel.ac.in/downloads/112108148>
2. <https://nptel.ac.in/downloads/112105129>
3. <https://nptel.ac.in/courses/116102012>

List of Suggested Experiments:

1. To understand construction and working of various types of boilers.
2. To understand construction and working of mountings and accessories of boiler.
3. To study of working of two stroke and four stroke Petrol & Diesel Engine.
4. To determine the Swept volume & Clearance volume of Two stroke & Four stroke Petrol & Diesel Engine.
5. To study Vapour Compression Refrigeration System.
6. To study various types of gears and pulleys
7. To study various types of brakes.
8. To study various types of coupling.
9. To study of various types of clutches.
10. To understand different arrangement and application of various power transmission drives.



M. Sc. IT in Animation, VFX and Gaming (SEC)

Semester 1

Subject Code: SEC001	Subject Title: Animation and Graphic Design
Pre-requisite:	

Course Objective:

- Acquire the skills off off visualization for different products
- Develop the skill of animation and conceptual visualisation.
- Learn animation and how it works for different kinds of product and commercial values.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Practical		Theory		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
1	0	2	2	00	00	25	25	50

Subject Contents			
Sr. No.	Topics	Teaching Hrs.	Weightage (%)
1	Subject and topic overview Fundamental of design and introduction to elements and principle of design Elements of design line shape space texture and colour	3	
2	Principals of design balance contrast emphasize freedom unity	3	
3	Basics of typography on type spacing redibility	2	
4	Visual design as a communication (including colour phycology and colour meaning).	2	
5	Architecture of advertising design. Design psychology and emotion Product brand identity and each importance like logo designs etc. Design for Digital media and print media	4	
6	Introduction to animation and its different types . Animation as a form of advertising in different domains. Understanding the various pipeline of animation production in contrast to different media. Different types of tools for animation.	2	
7	Motion graphics and video editing Understanding motion graphics like explainer videos corporate presentations e-learning product promotion	2	
8	Doubt solving solution student can show their works and clear doubts	2	

Course Outcomes:

- The students will be able to understand the concepts of visualization and story telling in different way and will understand different production pipeline of animation, game

designing ,e-learning, e-commerce and various other content and its structure.

- They will be able to understand how to visualize different contents according to target audience in different sectors in this entertainment industry
- The students will able to understand the basic objective and the fundamentals of Graphic design and animation concepts and apply them in different product.
- They will be able to design and implement them, making good use of the features of the software such as apps designing , game designing , animated short film , Advertising design, with different media and materials.

List of Reference Books:

1. Script to screen by Linda seger
2. Ogilvy on advertising buy a ogilvy.
3. Animators survival kit by Richard William
4. Thinking with type by Ellen Lupton
5. Graphic design the new basic by Ellen Lupton and Jennifer cole Philips
6. Making and breaking the grid a graphic design layout workshop by Timothy samara

List of suggested experiments :

1. Typographical poster design. Create a poster using only typography focusing on layout font selection hierarchy and balance to convey a message visually
2. Colour theory practice experiment with colour schemes (complementary analogue triadic) by creating a set of poster or images using this colour combination.
3. Logo design basics designer logo for an imaginary brand to practice simplicity.
4. Design a simple animation showing any product promotion
- 5 . Design a simple explainer video of any service provider.



GANDHINAGAR INSTITUTE OF TECHNOLOGY

B. Tech 1st /2nd SEMESTER

CSE/IT/EE/EC/CS/AI/ICT

DOC NO: 4061

Subject Code: 10000004	Subject Title: ENGINEERING PHYSICS
Pre-requisite: Nil	

Course Objective:

- To understand concepts of applications of semiconductor Physics, nanomaterials and non-linear optics in respective engineering branches and measurement techniques to solve problems.
- To educate students for engineering occupations in which Physics concepts may be applied to technological development. Students will be able to find work in engineering after completing this study at the interface of engineering and Physics upon graduation, while also laying a solid basis for graduate school and engineering research.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
03	-	02	04	70	30	30	20	150

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Nanoscience and nanotechnology: Introduction to Quantum Physics: Particle in a three dimensional box, Introduction – Nanoscale; Nanomaterials: Methods for synthesis of nanomaterials, Properties of nanomaterials, Characterization techniques – X ray Diffraction (XRD) - Single Crystal, Powder and Laue techniques, Low energy Electron Diffraction (LEED), Scanning Electron Microscopy, Tunnelling Electron Microscopy, Nanostructures; Carbon nanotubes, Characteristics and applications, Nanotechnology and environment.	8	19



2	Classification of Electronic Materials: Free electron theory, crystal structure and reciprocal lattice, Density of states and energy band diagrams, Kronig-Penny model (to introduce origin of band gap), Brillouin zone, electron in a crystal- Bloch's electron, Energy bands in solids, E-k diagram, Direct and indirect bandgaps, Types of electronic materials: metals, semiconductors, and insulators, Density of states, Occupation probability, Fermi level, Effective mass, Phonons.	8	19
3	Physics of Semiconductors: Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Carrier transport: diffusion and drift, p-n junction diode, Metal-semiconductor junction (Ohmic and Schottky), Photovoltaic effect, Exciton, Applications with numericals, Lasers and its properties, Spontaneous and stimulated emission, Einstein coefficients, Gas laser (He-Ne Laser), Semiconductor Laser, Applications of Laser.	8	19
4	(A)Analysis of Errors: Uncertainties in Measurements: Sources and estimation of errors, accuracy and precision, systematic error, random error, Significant figure and round off, Uncertainties, Parent and Sample Distributions, Mean and Standard Deviation of Distributions, Average error, r.m.s error, probable error and error propagation, (B) Non-linear Optics: Introduction to regression analysis and its uses, Basic Principle of Holography, Construction and reconstruction of hologram, Applications of Holography, Introduction to optical fiber, Numerical Aperture of optical fiber, Types of optical fiber, applications of optical fiber (C)Measurement Techniques: Four-point probe and Van Der Pauw measurements for carrier density, Resistivity and hall mobility, Hall effect, Hot-point probe measurement, capacitance-voltage measurements, DLTS.	12	29
5	Physics of Superconductors: Introduction of Superconductivity, Properties of superconductor, Effect of magnetic field, Meissner effect, Pressure effect, Impurity effect, Isotopic mass effect, Mechanism of Superconductivity: BCS Theory, Penetration depth: Magnetic field, Josephson's junction and its application, Application of superconductors	6	14

Course Outcome: After completion of this course, student will be able to

- Acquire understanding of fundamental physics concepts and link them to engineering science at the conclusion of the course.
- Use physics ideas to solve difficulties in engineering.
- Apply basic Physics concepts to solve new and difficult technological issues.



- The student will gain knowledge of basic theoretical and mathematical concept of nanomaterials and electronic materials.
- Demonstrate understanding of basic principles, properties and applications associated with semiconducting materials.
- Learn how to calculate and find the errors and also characterize diverse semiconducting, electrical, and optoelectrical materials and devices using various measurement techniques and non-linear optics.
- Demonstrate knowledge of superconductivity's fundamental theory, characteristics, and applications.

List of References:

1. T. Pradeep, Nano: The Essentials, New Central book Agency.
2. S. N. Goswami, Elements of Plasma Physics, Tata McGraw Hill publication.
3. B. L. Theraja, Physics for Engineers, S Chand Publication
4. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc.
5. B. E. A. Saleh and M. C. Teich, Fundamentals of Photonics, John Wiley & Sons, Inc.
6. S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley (2008).
7. A. Yariv and P. Yeh, Photonics: Optical Electronics in Modern Communications, Oxford University Press, New York (2007).
8. P. Bhattacharya, Semiconductor Optoelectronic Devices, Prentice Hall of India (1997).
9. Engineering Physics by Dattu R Joshi, McGraw hill Publications.
10. Resnick, Halliday and Krane, Physics part I and II, 5th Edition John Wiley (2002)
11. Physics for scientists and engineers with modern physics by Jewett & Serway, Cengage publications.

Open e-Resource:

1. Online course: "Semiconductor Optoelectronics" by M R Shenoy on NPTEL.
(URL Link: <https://nptel.ac.in/courses/115102026>)
2. Online course: "Optoelectronic Materials and Devices" by Monica Katiyar and Deepak Gupta on NPTEL. (URL Link: <https://nptel.ac.in/courses/113104012>)
3. Online course: "Fiber Optics" by Prof. Vipul Rastogi on NPTEL.
(URL link: <https://nptel.ac.in/courses/115107095>)
4. Online course: "Introduction to Physics of Nanoparticles and Nanostructures" by Prof. G. Mukhopadhyay on NPTEL. (URL Link: <https://nptel.ac.in/courses/115101007>)
5. Online course: "Introduction to Non-linear optics and its applications" by Prof. Samudra Roy on NPTEL
(URL Link: <https://nptel.ac.in/courses/115105105>)
6. Online course "Superconductivity" by Prof. P. P. Singh and Prof. A. V. Mahajan
(URL Link: <https://nptel.ac.in/courses/115101012>)
7. Online course "A brief course on Superconductivity" by Dr. Saurabh Basu on NPTEL.
(URL Link: <https://nptel.ac.in/courses/115103108>)
8. The Feynman Lectures series on Physics Vol 2, Pearson Education India

List of Suggested Experiments:

1. To find the numerical aperture of an optical fiber.
2. To determine the band gap in a semiconductor using a junction diode.
3. To determine the wavelength of laser using diffraction grating.
4. To find the efficiency of a solar cell.
5. To Study the characteristics of a Zener diode and a LED.



6. To study the “Hall effect” by measuring the voltage and magnetic field, keeping current constant.
7. Determination of radii of curvature of lens using the Newton’s ring formula.
8. Analysis of errors using Least square fitting.

**GANDHINAGAR UNIVERSITY
GANDHINAGAR INSTITUTE OF TECHNOLOGY**

**10000201: Engineering Mathematics-II
B. TECH. 2nd SEMESTER (All Branches)**

DOC NO: 4061

Subject Code: 10000201	Subject Title: Engineering Mathematics-II
Pre-requisite: Basic knowledge of differentiation, integration, algebra	

Course Objective: The objective of this course is to familiarize the prospective engineers with techniques in integration, ordinary differential equations and matrices. It aims to equip the students to deal with advanced level of mathematics and applications that are required in their disciplines.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	2	0	5	70	30	0	50	100

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	First order ordinary differential equations: Order and Degree, Solutions of Ordinary differential equations, Geometrical Interpretations, Exact, Non-exact, Linear and Bernoulli's equations, Euler's equations	6	10%
2	Higher order Ordinary differential equations: Second order linear differential equations with constant coefficients, Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation, Series Solutions of ordinary differential equations	10	25%
3	Laplace Transformation: Definition of Laplace Transform, Existence of Laplace transform, Properties of Laplace transforms, Laplace transform of periodic functions, Inverse Laplace transform and their properties, Convolution theorem, Applications of Laplace transforms in solving ordinary differential equations and system of differential equations	8	20%
4	Fourier Series and Fourier Integral: Dirichlet's Condition, Fourier series of Odd and Even functions, Half range sine series and cosine series, Fourier Integral, Fourier Cosine and Sine Integrals Gamma and Beta functions: Definitions of Gamma and Beta functions and their properties	8	20%
5	Matrix Algebra: Definition of Matrix, types of matrices and their properties, Determination of rank, The inverse of a matrix by Gauss Jordan method, Solution of a system of linear equations by Gauss elimination and Gauss Jordan Methods, Eigen values and Eigen vectors of matrices, Cayley-Hamilton's Theorem and its applications, Diagonalization	10	25%

w.e.f. AY 2022-23

Course Outcome:

At the end of the course the students will be able to

1. Learn the techniques to solve ordinary differential equations for Mathematical modelling of real-world problems.
2. Apply effective mathematical methods for the solutions of higher order ordinary differential equations.
3. Apply the techniques of Laplace transforms and inverse Laplace transforms to solve the Ordinary differential equations of real-world problems
4. Utilize Fourier series to study the behavior of periodic functions and to gain the knowledge of Fourier Integral and to acquire understanding on how to tackle integration problems using Gamma and Beta functions.
5. Understand the algebra of matrices in order to solve applied and theoretical issues using algebraic operations

List of References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India Edition.
2. Peter O'Neill, Advanced Engineering Mathematics, 7th Edition, Cengage
3. H.K.Dass, Advanced Engineering Mathematics, S. Chand.
4. H. Anton, Elementary linear algebra with applications (8th Edition), John Wiley 1995
5. Fuzhen Zhang, Matrix Theory- Basic Results and Techniques, Springer, 1999
6. Shanti Narayan, P.K. Mittal, A Textbook of Matrices, S Chand & Company, 2010

Open e-Resource: Digital Platforms

- National Programme on Technology Enhanced Learning (NPTEL)
- SWAYAM
- National Digital Library of India (NDLI)
- Massachusetts Institute of Technology (MIT) Open Learning



GANDHINAGAR INSTITUTE OF TECHNOLOGY

B.TECH 1st / 2nd SEMESTER

**Computer Engineering /Information Technology /Electronics & Communication Engineering /
Electrical Engineering / Civil Engineering / Mechanical Engineering**

DOC NO: 4061

Subject Code: 10030101	Subject Title: Basics of Electrical & Electronics Engineering
Pre-requisite: Nil	

Course Objective:

- To Impart the basic knowledge of electrical quantities and to understand the impact of technology in a global and social context.
- To provide knowledge of analog and digital electronics.
- To Introduce the basic knowledge of transformer and electrical machines and electrical safety.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	0	2	4	70	30	30	20	150

Subject Contents				
Sr. No	Topic	Total Hours	Weight (%)	
1	DC Circuits Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.	8	20%	
2	AC Circuit: Representation of sinusoidal waveforms, sinusoidal function- Terminology, Form Factor and Peak Factor, Phase and Phase Difference, Phasor representation of alternating quantities, Phasor addition and subtraction Behavior of purely resistive, inductive and capacitive circuits, Phase relation RL circuit, series RC circuits, series RLC circuit between voltage and current Active, Reactive and Apparent Power, Power Factor and Parallel and series-parallel AC circuits, Resonance in series and parallel circuit. Three-phase balanced circuits, voltage and current relations in star and delta connections.	10	23%	

3	Transformers and Electrical machines Construction and working principle of single phase and three phase transformers Equation, voltage and current Ideal and practical transformer, autotransformer. Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, single phase induction motor	6	14%
4	Analog Electronics and Applications: Semiconductor Diode & its characteristics, Half-Wave, Full-Wave & Bridge Rectifier, Zener Diode, Light-Emitting Diode (LED), Photo diode, Solar cell and Seven Segment Display. Bipolar Junction Transistor, Amplifier, Oscillator and Operational Amplifier.	8	20%
5	Digital Electronics: Number System, Basic Logic Gates, Building AND, OR & NOT Gate using Diodes and Transistors, Digital logic families, RTL, DTL, TTL.	4	9%
6	Electrical Installations: Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.	6	14%

Course Outcome: After completion of this course, student will be able to

- Analyze electrical circuits with different elements and describe qualitative comparison between AC and DC systems.
- Understand the construction, working and basic characteristics of transformer and Induction machine
- Learn about the working of Bread-Board, Multimeter, Power Supply, Function Generator, CRO/DSO, GCB/PCB.
- Apply Diodes, Transistors and Logic Gates in different circuits.
- Recognize the importance of protective devices and electrical safety measures.

List of References:

1. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
2. Basic Electrical Engineering - Nagsarkar and Sukhija, Oxford University Press
3. B. L. Theraja, "Electrical Technology – Part I and II", S. Chand and Co. 2012
4. V.N. Mittal, 'Basic Electrical Engineering', Tata McGraw-Hill, 2nd edition 2006.
5. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
6. A. Chakrabarti, S. Nath, C. Chanda, 'Basic Electrical Engineering', Tata McGrawHill Education India Pvt. Ltd, 2013.
7. Robert Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education, 10th Edition, 2009.
8. Albert Malvino and David Bates, "Electronics Principles" Tata McGraw-Hill, 7th Edition, 2006.
9. Digital Logic and Computer Design By M Morris Mano, Prentice Hall Publication, Fourth Edition.

Open e-Resource:

1. <http://vlab.amrita.edu/index.php>
2. <https://www.facstaff.bucknell.edu/mastascu/eLessonsHTML/EEIndex.html>
3. <http://www.learnabout-electronics.org>
4. <http://www.electronics-tutorials.ws>
5. <https://www.coursera.org/course/eefunlab>
6. <https://www.coursera.org/course/introtoelectronics>
7. <http://www.electronicssandyou.com>
8. https://onlinecourses.nptel.ac.in/noc21_ee55/preview
9. PSpices and NGSpice (Open Source Software)

List of Suggested Experiments:

1. To verify ohm's law in an electric circuit.
2. To verify KCL and KVL in an electric circuit.
3. To verify the Network theorems
4. To determine power in a single phase circuit using wattmeter.
5. Determination of B-H curve of magnetic material.
6. Analysis series RLC circuit.
7. Demonstration of domestic installations like MCB, ELCB, MCCB
8. To determine power in a three phase circuit using two wattmeter.
9. Demonstration of cut-section models and charts of various machines.
10. Understanding of various electrical bills and calculation for energy consumption.
11. To study and perform the VI characteristics of P-N junction diode
12. To study and perform the VI characteristics of Zener diode.
13. To study and perform about the Half Wave and Full Wave Rectifier.
14. To study and perform the Input and Output characteristics of a Transistor.
15. To study and configure an op-amp as an inverting and non-inverting amplifier.
16. To study and verify digital logic gates.
17. To configure diodes and transistors as logic gates and verify the truth table.



Gandhinagar Institute of Management

**B.Tech
Semester II**

DOC NO: 4061

Subject Code: AEC015	Subject Title: Personality Development for Effective Leadership
Pre-requisite: NA	

Course Objective:

1. To help students in enhancing their self-awareness, interpersonal skills, and overall personal grooming.
2. To foster personal growth and development by focusing on self-awareness, communication skills, emotional intelligence, and goal setting.
3. To explore various aspects of personality enhancement and leadership qualities for improving their confidence, firmness, and relationships with others.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
2	-	-	2	25	25	-	-	50

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Understanding Personality Development • Definition and Importance of Personality • Determinants of Personality: Heredity and Environment • Theories of Personality (Big Five Model, MBTI, etc.) Self-Awareness and Self-Analysis • SWOT Analysis for Personality Growth • Building Self-Confidence and Positive Thinking • Overcoming Self-Limiting Beliefs	7	25%
2	Leadership and Its Significance • Definition and Characteristics of an Effective Leader • Leadership vs. Management • Different Leadership Styles (Autocratic, Democratic, Transformational, etc.) Effective Communication Skills	7	25%



	• Verbal and Non-Verbal Communication • Barriers to Communication and Overcoming Them • Public Speaking and Presentation Skills		
3	Emotional Intelligence (EI) and Leadership • Components of Emotional Intelligence (Self-Awareness, Self-Regulation, Motivation, Empathy, Social Skills) • Role of EI in Decision-Making and Conflict Resolution • Developing Empathy and Active Listening Skills Building Leadership Skills • Goal Setting and Strategic Thinking • Motivation and Team Building • Time Management and Delegation	7	25%
4	Decision-Making and Problem-Solving • Decision-Making Models (Rational Model, Intuitive Model, etc.) • Overcoming Decision-Making Biases • Critical Thinking and Analytical Skills Ethics and Values in Leadership • Ethical Decision-Making in Leadership • Corporate Social Responsibility and Leadership Ethics • Leading with Integrity	7	25%

Course Outcome:

- To comprehend the role of confidence and self-esteem in personal development.
- To create a comprehensive action plan for personality enhancement and leadership development.
- To cultivate personality and leadership qualities in diverse and inclusive environments.

List of Textbooks:

1. D. P. Subharwal – Personality Development Handbook
2. Rajiv Mishra – Personality Development: Transform Yourself
3. Dr. Shailesh Tondon & Dr. Asish Kaushal – Personality Development & Grooming
4. Del Carnegie – The Leader in You
5. Andrew Bryant – Self Leadership
6. Peter G. Northouse – Leadership: Theory and Practice
7. Radcliffe – Leadership: Plain and Simple

List of Reference Books:

NA

**Open e-Resource:**

1. English GUETA Website
2. English GUETA App
3. English GUETA YouTube Channel

List of Suggested Experiments: NA

GANDHINAGAR
 UNIVERSITY
Gandhinagar University
UG/PG
Semester-II

Subject Code: IKS0201	Subject Title: Indian Ancient History and Cultural Heritage
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Course Objective:

- Foster an appreciation for the composite nature of Indian history, culture and heritage.
- Instill a sense of love and belonging among learners, contributing to nation-building efforts.
- Provide an overview of various components of cultural heritage, including fairs, festivals, dances, art, architecture, and historical landmarks, which are crucial for a deeper understanding of history.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
01	0	2	02	0	25/ Project	25/ Project		50

Subject Contents			
Sr. No	Topics	Total Hours	Credit
1	Indian Ancient History: Introduction of Ancient India. Harappan Civilization. Rigvedic & Later Vedic Period. India in the 6th Century B.C. Persian and Greek invasions and its impact. Mauryan and Gupta Periods. Post – Mauryan. Brief History of the Sanskrit literature: The Vedas, The Brahmanas and Upanishads & Sutras, Epics: Ramayana and Mahabharata & Puranas.	15	1
2	Indian Cultural Heritage: Ethnic Indian Cultural Construct – Fairs & Festivals and their historical background. Indian dances as Cultural Heritage. Indian Architecture: Temples, Stupas, Caves, Chaityas. Medieval Architecture and Colonial Architecture. Social culture in India- Vedic culture. Ancient period- varna and jati, family and marriage in India, position of women in ancient India, Contemporary period; caste system and communalism.	15	1



Course Outcome: After completion of this course, students will be able to

- Demonstrate knowledge of the key events, periods, and figures that have shaped Indian history from ancient to modern times, including their impact on the socio-political and economic landscape.
- Analyze the rich cultural heritage of India, including art, architecture, literature, and philosophy, while recognizing the contributions of various communities to India's pluralistic society.

List of Text Books:

1. An advanced history of India – causes and decline of Guptas by B.C. Majumdar and others, 1967, Macmillan.
2. Ancient India by R.C. Majumdar, 1977, Motilal Banarasi Das.
3. History of Ancient India by Rama sankar Tripathi, 1942, Motilal Banarasi Das.
4. History and culture of India to 1000 A.D. by H.V. Srinivasa Murthy, 1980, S. Chand and Co.
5. History of South India by K.A. Nilakanta Sastry 1976, Oxford University Press.
6. History of Ancient India by Krishnaswamy Aiyangar, 1980, Seema Publishers.
7. Ancient India by V.D. Mahajan, 1985, S.Chand and Company.
8. Advance History of India by K.A. Nilakantasastry and C.S.Srinivasachari, 1980, Allied Publishers.
9. Ancient Indian History and Civilization by Silendranath Sen, 1988, Wiley Eastern.
10. Lothal and Indus Civilizations by S.R.Rao, 1972, Asia Publishers, Madras

Gandhinagar Institute of Technology

B. Tech

Department of CE & IT

Semester 2

Subject Code: SEC019	Subject Title: Social Media Management
Prerequisite: Active mindset, Basic Computer understanding & Practical Thinking	

Course Objective:

- Students will learn by doing assignments focusing on social media, post writing and publishing, management and measurement tools, a social media audit, editorial calendar and crises management.
- Students will master the skills necessary to become successful social media managers.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
2	0	0	2	-	50	-	-	50

Subject Contents			
Sr. No.	Topics	Teaching Hrs.	Weightage (%)
1	Unit 1: Introduction To Social Media Introduction to Social Media, importance of social Media, History and evolution of Social Media, Managing Information, Aggregators. Facebook, Twitter, Instagram, LinkedIn, YouTube, Blogs.	6	
2	Unit 2: Using Social Media Strategy Plan for Social Media Management, Touchpoint, Analysis Scheduling, Creating Content, Managing Content programmes, Planning Worksheet, Social media campaign.	6	

3	Unit 3: Evaluating Social Media Evaluation of Social Media Platforms, Content Management Systems (CMS), Tools to manage and measure performance of social media content and campaign, Handling critical issues in social media management and legal aspects of social media.	6	
4	Unit-4: Social Media Awareness	2	

List of Reference Books:

1. Guy Kawasaki & Peg Fitzpatrick, "The art of social media: power tips for power users"
2. Social media marketing all in one for dummies, Jan Zimmerman & Deborah N
3. Social media explained by Mark W. Schaefer

Approved
Rev see C&G
media &
management
for first year - 2024-25 course
Baten
A. Chelung
18/02/25 (Good CE & ST)

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GANDHINAGAR
UNIVERSITY
GANDHINAGAR UNIVERSITY
Semester-2

Subject Code: VAC021	Subject Title: Stress and Time Management
Pre-requisite: Candidate must have achieved regular degree in the 10+2 system from any recognized Board.	

Course Objective:

- (1) To develop and maintain a structured daily routine that balances work, personal responsibilities, and self-care activities
- (2) To prioritize tasks effectively by setting clear, achievable goals and deadlines, while incorporating regular breaks and mindfulness exercises to enhance focus, prevent burnout, and foster a positive mental state.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
02	-	-	02	25	25	-	-	50

Subject Contents			
Sr. No	Topics	Total Hours	Weight (%)
1	Unit 1: Understanding Mental Health and prevention Basic Concepts: Mental Health and Illness, Mental Health Continuum, Perspectives on Mental Health, Mental Health Issues and Challenges, The concept of Counseling and Psychotherapy, Psychological First Aid, Community Mental Health, Mental Health Capacity Building, Mental Health Literacy.	10	33%
2	Unit 2: Mental Health, Stress and its effect Meaning, elements and purposes, Characteristics and causes of poor mental health, achieving mental health and role of teachers, Nature, meaning and types of stress, Factors influencing stress, Causes and remedial measures.	10	33%
3	Stress and Adaptation - Introductory concepts Introduction, Sources, Effects, Indicators & Types of Stress, Types of stressors, Stress Adaptation – General, Adaptation Syndrome (GAS), Local, Adaptation Syndrome (LAS), Manifestation of stress - Physical & psychological, Coping strategies/ Mechanisms, Stress Management,	10	34%



	Assist with coping and adaptation, Creating therapeutic environment, Recreational and diversion therapies		
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Course Outcome: After completion of this course, student will be able to

- Students will be able to apply effective time management techniques, such as prioritization, goal setting, and scheduling, to optimize productivity and reduce stress
- Students will develop a deeper understanding of their mental health needs and recognize the importance of self-care
- Students will learn and implement mindfulness, relaxation, and stress management techniques to cope with daily challenges and prevent burnout.

List of Reference Books:

1. Westerhof, G. J. & Keyes, C. L. M. (2010). Mental Illness and Mental Health: The Two Continua Model Across the Lifespan. *Journal of Adult Development*, 17, 110119
2. Keyes, C. L. M. (2005). Mental Illness and/or Mental Illness? Investigating Axioms of the Complete State Model of Health. *Journal of Consulting and Clinical Psychology*, 73 (3), 539- 548
3. Snyder, C. R. & Lopez, S. J. (Eds.) (2002). *Handbook of Positive Psychology*. Oxford: Oxford University Press
4. Kearney, C. A. & Trull, T. J. (2012). *Abnormal Psychology and Life: A Dimensional Approach*. Wadsworth: Cengage Learning
5. Aggarwal, J. C. (2011). *Essentials of Edu. Psychology*. New Delhi: Vikas Pub. House.
6. Mangal, S. K. (2015). *Advanced Educational Psychology*. New Delhi:
7. Mattoo, M. I. (2019). *Psychological Foundations of Education*. New Delhi: Discovery Publishers.



Gandhinagar Institute of Technology
Bachelor of Technology Civil Engineering/Mechanical Engineering
Semester 3

Subject Code: 10000303	Subject Title: Statistics and Partial Differential Equations
Pre-requisite: Differential Calculus, Fundamental Statistics	

Course Objective:

- To provide an overview of probability and statistics to engineers
- To introduce the solution methodologies for second order Partial Differential Equations with applications in engineering

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	1	-	4	70	30	-	-	100

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Basic Probability: Mathematical & Statistical definition of Probability, Conditional Probability, Baye's Theorem, Discrete Random Variables, Probability Mass Function, Continuous Random variables, Probability Density Function Special Probability Distribution: Binomial Distribution and its properties, Poisson Distribution and its properties, Normal Distribution and its properties	10	24
2	Basic Statistics: Measure of Central Tendency, measure of variance Karl Pearson's Coefficients of Skewness, Moments, Correlation and its properties, Types of Correlation, Correlation Coefficient, Rank Correlation, Regression, Regression Coefficient, Properties and Expressions of Regression Coefficient, Least Square Approximation, Fitting of Linear Curve, Quadratic Curve and Non-linear Curves	10	24
3	Sampling Theory: Test of Hypothesis, Level of Significance, Critical Region, One tailed and two tailed test	8	19



	Test of Significant for Large Samples: Means of the samples and test of Significant of means of two large samples, Test of Significant of Small Samples: Chi-Square Test: Test of Goodness of Fit and Independence of Attribute		
	First Order Partial Differential Equations: Lagrange's' Linear Partial Differential Equations of First Order, Non-Linear Partial Differential Equations of First Order, General Method of finding solutions of first order Nonlinear PDEs (Charpit's Method)	6	14
6	Higher Order Partial Differential Equations: Solution of Homogeneous Linear Partial Differential Equations with Constant Coefficients, Solution of Non-Homogeneous Linear Partial Differential Equations with Constant Coefficients, Classification of Second Order Partial Differential Equations, Method of Separation of Variables: One dimensional Wave Equation, One dimensional Heat Equation, Two-dimensional Laplace's Equation	8	19

Course Outcome: After completion of this course, student will be able to

1. Interpret the basic principles of probability theory in problem solving situations and learn about different probability distributions to tackle statistical issues.
2. Outline the statistical data using measures of central tendency and classify the methods of correlation and regression to find relationships between variables and forecast outcomes.
3. Learn how to create and evaluate hypotheses, determine the likelihood that hypotheses will be incorrect, and make conclusions using crucial values.
4. Solve field problems in engineering involving PDEs.

List of Textbooks:

1. Ravish Singh, Mukul Bhatt, Probability and Statistics, Tata McGraw Hill.
2. Ravish Singh, Mukul Bhatt, Complex Variables and Partial Differential Equations, Tata McGraw Hill.
3. N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

List of Reference Books:

1. Reena Garg, Engineering Mathematics, Khanna Book Publishing Company, 2022.
2. Reena Garg, Advanced Engineering Mathematics, Khanna Book Publishing Company, 2021.
3. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint)
5. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002

Open e-Resource:

- https://onlinecourses.nptel.ac.in/noc23_ma83/preview
- https://onlinecourses.nptel.ac.in/noc23_ma77/preview
- https://onlinecourses.nptel.ac.in/noc23_ma51/preview
- https://onlinecourses.nptel.ac.in/noc23_ma71/preview
- https://onlinecourses.nptel.ac.in/noc23_ma81/preview



GANDHINAGAR INSTITUTE OF TECHNOLOGY
Bachelor of Technology - Civil Engineering
Semester - III

Subject Code: 10020303	Subject Title: Fluid Mechanics
Pre-requisite: System of units, Laws of motion, Basic idea of force, Concept of centroid & Moment of Inertia	

Course Objective:

1. To develop a basic understanding about the properties of fluids, their behavior under static and dynamic conditions.
2. To enable the students to apply the basic principles of Fluid Mechanics to solve real life problems.
3. Analyze fluid flow through close conduits and open channels.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	0	2	4	70	30	30	20	150

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Properties of Fluids: Mass density, specific weight, specific gravity, specific volume, vapour pressure, compressibility, elasticity, surface tension, capillarity; Newton's law of viscosity, classification of fluids, dynamic viscosity, kinematic viscosity, variation of viscosity with temperature; Basic concept applicable to fluid mechanics.	4	10
2	Fluid Statics Measurement of Pressure: Pressure variation in static fluid, PASCAL's law, Units and scale of pressure measurement, simple manometers and differential manometers.	10	20



	Hydrostatic force on plane and curved surface: Total pressure and center of pressure, pressure diagram, Total pressure on plane surfaces and curved surfaces depth of center of pressure Buoyancy and Flotation: Buoyant force, Buoyancy and Center of Buoyancy, Archimedes Principle, Metacentre and Metacentric height, Equilibrium of floating and submerged bodies		
3	Fluid Kinematics and Fluid Dynamics: Fluid flow methods of analysis of fluid motion, Streamlines, Path lines, Streak lines and Stream tubes. Types of fluid flow, Reynolds experiment, velocity potential and stream function, flow net, Euler's equation, Bernoulli's equation, and its applications.	6	20
4	Flow Measuring Devices: Measurement of discharge- Venturimeter, Orificemeter, Nozzlemeter, Rotometer. Measurement of velocity-Pitot tube. Orifice, Mouthpiece, Notches, and weirs	6	10
5	Flow Through Pipes: Major and minor energy losses, hydraulic gradient and total energy line, pipes in series and parallel, pipe networks by Hardy Cross method	4	10
6	Open Channel Flow: Basic concept of open channel flow, Velocity distribution, Energy equation, specific energy diagram, discharge diagram, Application of specific energy and discharge diagrams. Nonuniform steady flow-equations for gradually varied flow, rapidly varied flow, Hydraulic jump.	8	20
7	Dimensional Analysis and Similitude: Fundamental Dimensions-Physical Quantity and Dimensions-Dimensional Homogeneity, Determination of Dimensionless parameters, Methods of Dimensional analysis, Model Similitude	4	10

Course Outcome:

Sr. No.	CO statement
CO-1	Describe types of fluid and determine their properties and to Measure pressure and calculate hydrostatic pressures and forces on flat/curved surfaces.
CO-2	Analyze forces on floating and immersed bodies and understand fluids in relative equilibrium and to Know the basics of fluid kinematics and dynamics.
CO-3	Calibrate fluid flow measuring devices like venturimeter, orificemeter, notches, orifice, mouthpieces.
CO-4	Understanding of Major and Minor Energy losses in pipes and analyze fluid flow through pipes in series, parallel and pipe networks under laminar and turbulent flow conditions.
CO-5	Analyze open channel flow and design optimal sections; calculate forces on sluice gates considering specific energy and momentum principle. Carry out model studies for fluid flow problems.

**List of Text Books:**

1. Title: A Text Book of Fluid mechanics & Hydraulic Machines, Author: Bansal, R. K., Publisher: Laxmi Publications.
2. Title: Fluid Mechanics, Author: A.K. Jain, Publisher: 4th edition, Khanna Publishers.
3. Title: Hydraulics and Fluid Mechanics, Author: P.N. Modi and S.M. Seth, Publisher: Standard Book House, New Delhi.
4. Title: Engineering Fluid mechanics, Author: K.L. Kumar, Publisher: 8th Edition S. Chand & Company Ltd.

List of Reference Books:

1. Title: Theory and Applications of Fluid Mechanics, Author: K. Subramanya, Publisher: Tata McGraw Hill.
2. Title: Fluid Mechanics, Author: Frank M White, Publisher: McGraw Hill Publication.

Open e-Resource:

1. <https://nptel.ac.in/courses/105103192>

List of Suggested Experiments:

1. Measurement of viscosity
2. Study of pressure measurement devices
3. Stability of Floating body
4. Verification of Bernoulli Theorem
5. Determine Hydraulic coefficients of a small circular orifice.
6. Calibration of flow measuring devices (Venturimeter, Orificemeter, Rectangular and V-notch)
7. Fluid flow pattern using Reynolds's Apparatus (Reynolds experiment)
8. Friction Loss in pipes
9. Hydraulic Jump in Horizontal open Channel
10. Similitude and Model Studies



GANDHINAGAR INSTITUTE OF TECHNOLOGY
Bachelor of Technology - Civil Engineering
Semester-III

Subject Code: 10020305	Subject Title: Mechanics of Solids
Pre-requisite: Basic understanding of Physics and Mathematics	

Course Objective:

1. Mechanics is the name of the field of applied science that deals with either the state of rest or the condition of motion.
2. Engineers are eager to apply the rules of mechanics to practical field issues. Engineering mechanics is the practice of using the laws of mechanics to solve practical issues.
3. The laws and principles of mechanics will be taught to the students, along with how they apply to engineering problems.
4. Mechanics of solids is very essential for an engineer in planning, designing and construction of various types of structures and machines, so that the design is safe and economical.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	0	2	4	70	30	30	20	150

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Introduction: Scalar and vector quantities, Composition and resolution of vectors, System of units, Definition of space, time, particle, rigid body, force. Principle of transmissibility, Principle of superposition, Law of gravitation	2	5
2	Fundamentals of Statics:	10	25



	Force: Types of Forces, Characteristics of a force, System of forces. Coplanar concurrent forces: Resultant of coplanar concurrent force system by analytical method only- Law of parallelogram of forces, Law of triangle of forces, Law of polygon of forces, Composition and resolution of forces, Equilibrium conditions for coplanar concurrent forces, Equilibrant, Free body diagrams, Lami's theorem. Coplanar non-concurrent forces: Moments & couples, Characteristics of moment and couple, Equivalent couples, Force couple system, Varignon's theorem, Parallel forces, Resultant of non-concurrent forces by analytical method only, Equilibrium conditions of coplanar non-concurrent force system, Equilibrant, Free body diagrams.		
3	Center of gravity and moment of inertia Center of gravity and centroid: Centroid of lines, plane areas and volumes, Pappus – Guldinus first and second theorems. Moment of inertia of planar cross-sections: Parallel & perpendicular axes theorems, polar moment of inertia, radius of gyration of areas.	6	10
4	Friction Theory of friction, Types of friction, Static and kinetic friction, Cone of friction, Angle of repose, Coefficient of friction, Laws of friction, Friction on inclined plane, ladder friction, wedge friction, belt and rope friction.	4	10
5	Simple stresses & strains Normal/axial stresses: Tensile & compressive, Shear and complementary shear. Strains: Linear, shear, lateral, thermal and volumetric. Elastic Constants: Modulus of elasticity, Poisson's ratio, Modulus of rigidity and bulk modulus. Analysis of normal stress & strains: Homogeneous and composite bars having uniform & stepped sections axial loads and thermal loads, hoop stresses, analysis of homogeneous prismatic bars under multidirectional stresses.	8	20
6	Statically determinate beams Beams: Types of loads, Types of supports, Types of beams; Determination of support reactions. Bending moment and shear force: Relationship between loading, shear force & bending moment, bending moment and shear force diagrams for beams subjected to only three types of loads: i) concentrated loads ii) uniformly distributed loads iii) couples and their combinations; Point of contraflexure.	4	10
7	Stresses in homogeneous beams Bending stress in beams: Pure bending, Theory of pure bending, Neutral axis, Moment of resistance, Relationship between moment of resistance, Bending stress, moment of inertia, Radius of curvature and modulus of elasticity; Section modulus. Shear stress in beams: Horizontal shear stress, Relationship between shears force, shear stress and moment of inertia; Horizontal shear stress distribution diagrams across beam section; average shear stress.	4	10
8	Principal stresses	4	10



	Analytical solution for elements under axial and shear stress: Normal, tangential and resultant stress on inclined plane, angle of obliquity of resultant stress, maximum shear stress, principal planes and principal stresses, principal stresses in beams under bending and shear.		
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Course Outcome:

Sr. No.	CO statement
CO-1	Apply fundamental principles of mechanics & principles of equilibrium to simple and practical problems of engineering.
CO-2	Apply principles of statics to determine reactions & internal forces in statically determinate beams.
CO-3	Determine centroid and moment of inertia of a different geometrical shape and able to understand its importance.
CO-4	Know basics of friction and its importance through simple applications.
CO-5	Understand the different types of stresses and strains developed in the member subjected to axial, bending, shear in combination and graphically represent the distribution.

List of Textbooks:

1. Title: Engineering Mechanics Author: R S Khurmi, Publisher: S Chand & Company
2. Title: Engineering Mechanics Author: S S Bhavikatti, Publisher: New Age International Ltd.
3. Title: Engineering Mechanics Author: A.K. Tayal, Publisher: Umesh Pub.
4. Title: Strength of Materials Author: S. Ramamruthum & R. Narayan, Publisher: Dhanpat Rai.

List of Reference Books:

1. Title: Mechanics for Engineers - Statics Fourth Edition Author: F. P. Beer and E. R. Johnson, Publisher: McGraw-Hill
2. Title: Mechanics of Materials 2nd Edition Author: Timoshenko and Gere, Publisher: CBS
3. Title: Engineering Mechanics of Solids Author: E P Popov, Publisher: Prentice Hall India Learning Pvt. Ltd

Open e-Resource:

1. <https://nptel.ac.in/courses/105104160>

List of Suggested Experiments:

1. Equilibrium of coplanar concurrent forces
2. Equilibrium of coplanar non-concurrent forces
3. Equilibrium of coplanar parallel forces: Determination of reactions of simply supported beam.
4. Verification of principle of moment: Bell crank lever



5. Determination of coefficient of static friction using inclined plane
6. Determination of parameters of machines: (a) Wheel and differential axles (b) Single purchase crab
7. Determination of hardness of metals: Brinell hardness test
8. Determination of impact of metals: Izod/Charpy impact test
9. Determination of compression test on (a) Metals –mild steel and cast iron (b) Timber –along and parallel to the grains.
10. Determination of tensile strength of metals



Gandhinagar Institute of Technology (01)
Bachelor of Technology
Civil Engineering Department
3rd Semester

Subject Code: 10020306	Subject Title: Concrete Materials and Technology
Pre-requisite: Introduction to Civil Engineering Structures, Construction Technology, Construction Materials	

Course Objective:

- Concrete is the most widely used construction material in the world made by mixing Portland cement with sand, crushed rocks and water.
- Concrete plays an important role in Infrastructure and Private Building Construction. It is heterogeneous and has complex microstructure.
- Understanding the basic behaviour of concrete is very important for civil engineering students to become efficient civil engineering professionals.
- Concrete technology acquaints the students with this second largest material in use after water. It will help the students to explore the material, its properties, intrinsic nature and application & also the recent advances in field of concrete technology

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	0	2	4	70	30	30	20	150

Subject Contents				
Sr. No	Topic	Total Hours	Weight (%)	
1	General: Historic development, Composition of concrete, Advantages of concrete over other materials, Advances and future trends in concrete, Overview of Sustainability and Concrete development.	2	05	
2	Ingredients of Concrete: Cement: Chemical composition, Hydration of cement, structure of hydrated cement, Tests on cement, Various types of cement Aggregates: Classification of aggregates, IS specifications, Properties of aggregates, Grading, Types of grading, Sampling & Testing of aggregates Water – General requirements & limiting values of impurities.	10	25	

	Admixtures: Additives & Admixtures, Types of admixtures, Applications, Mineral admixtures – Fly ash, silica fume, GGBS and other pozzolanic materials. Chemical Admixtures: Accelerators, Retarders, Water reducing admixutres, Plasticizers, Super plasticizers, Dosage and application.		
3	Fresh Concrete: Properties of fresh concrete, Definition and Measurement methods of workability as per IS and ASTM standards, factors affecting workability, Segregation & Bleeding, Slump loss, Re-tempering, Site preparations for concreting, Mixing, Conveying, Placing, Compaction, Finishing of concrete. Curing & various methods of curing.	6	14
4	Hardened Concrete: Strengths of hardened concrete (Tensile & Compressive strength, Flexural & Bond strength), standard test methods as per IS and ASTM, Failure mechanism under compression & tension, Stress-strain behavior of concrete, Overview of Modulus of elasticity, Dimensional stability – Creep & Shrinkage	6	14
5	Durability & Permeability of concrete: Causes of deterioration in concrete and durability problems, Factors affecting durability, Transport mechanism of gases & fluids in concrete, Cracking & causes of cracking, Carbonation induced & corrosion induced cracking, Alkali-aggregate reaction, Degradation by freeze & thaw, Sulphate attack, Durability under sea-water (marine environment).	6	14
6	Mix design of Concrete: Principles of concrete mix design, Parameters and factors influencing mix design, Indian Standard methods of mix design, Acceptability criteria, variability of results, Various provisions of IS code for sound concrete.	6	14
7	Special concrete and Concreting methods: High strength concrete, High performance concrete, Fiber reinforced concrete, Polymer modified concrete, Self-compacting concrete, Light-weight & heavy weight concrete, High volume fly ash concrete. Special concreting methods: Pumped concrete, Ready mix concrete, Under-water concreting, Hot & cold weather concreting, Precast concrete, Pre-placed concrete	6	14

Specification table with Marks:

Distribution of Theory Marks					
R	U	A	N	E	C
40%	40%	5%	5%	5%	5%

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

Course Outcome:

After learning the course the students should be able to:

1. Identify the important ingredients of concrete and its role in influencing the behaviour of concrete under different environment conditions.
2. Infer the results of the various experiments related to different ingredients of concrete, fresh concrete & hardened concrete
3. Apply the concepts of Mix design to produce the concrete of adequate strength and durability
4. Choose the correct type of concrete and concreting technology required for particular exposure and site condition.

List of Reference Books:

1. Title: Concrete Technology: Theory and Practice Author: M S Shetty & A K Jain
2. Publisher: S.Chand and Company Limited.
3. Title: Concrete Technology Author: M L Gambhir, Publisher: McGraw Hill Education
4. Title: Properties of Concrete Author: A.M.Neville Publisher: Pearson Education India
5. Title: Concrete Technology Author: D.F.Orchard Publisher: Contractors Record Limited/John Wiley
6. Title: Concrete Microstructure Properties Author: P Kumar Mehta Publisher: McGraw Hill Education
7. Title: Concrete Technology Author: A R Santhakumar Publisher: Oxford

Open e-Resource:

1. <http://www.nptel.iitm.ac.in/courses/>

List of Suggested Experiments:

1. Fineness test of cement
2. Standard consistency of cement
3. Initial and final setting of cement
4. Compressive strength of cement
5. Fineness modulus of aggregate
6. Aggregate Crushing Value Test
7. Aggregate Impact test
8. Slump Test

9. Compacting Factor Test
10. Compressive strength of concrete



GANDHINAGAR INSTITUTE OF TECHNOLOGY
Bachelor of Technology - Civil Engineering
Semester III

Subject Code: 10020307	Subject Title: Surveying
Pre-requisite: Fundamentals of Civil Engineering	

Course Objective:

1. To develop a basic understanding about the surveying and various operation of surveying instrument.
2. To enable the students to apply the basic principles of surveying to solve real life problems.
3. Survey of area using advanced survey instrument Total Station.
4. Learn the application of GPS and DGPS in surveying.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	0	2	4	70	30	30	20	150

Subject Contents				
Sr. No	Topic	Total Hours	Weight (%)	
1	Theodolite Traversing: Introduction, definitions, the Vernier transit theodolite, temporary and permanent adjustment of theodolite, measuring horizontal and vertical angles, methods of traversing, closing error, computation of latitudes and departure, check in closed and open traverse, balancing of traverse, Gale's table.	6	16	
2	Plane Table Survey: Introduction, principle, instruments, setting up the plane table, methods of plane tabling, advantages, sources of Errors.	4	10	



3	Trigonometric levelling: Indirect levelling, heights and distances, methods, direct levelling on steep ground.	4	10
4	Areas and Volumes: Introduction, computation of area, computation of area from field notes and plotted plans, boundary area, area of traverse, Use of Planimeter, computations of volumes, Volume from cross sections, Trapezoidal and Prismoidal formulae, Prismoidal correction, Curvature correction, capacity of reservoir, volume from borrow pits	4	10
5	Tachometric Surveying: Introduction, purpose, principle, instruments, methods of tacheometry, stadia constants, analytic lens, Subtense bar, field work in tacheometry, reduction of readings, errors and precisions.	5	12
6	Geodetic Surveying: Introduction, triangulation, principle and uses of triangulation, triangulation systems and its classification, well conditioned triangles, strength of figure, selection of triangulation stations and their inter-visibility, stations marks, signals, towers and scaffolds, base line, site selection and base line measurement, tape corrections, the base net, extension of base line, satellite station and reduction to centre.	4	10
7	Theory of Errors: Introduction, types of errors, definitions, laws of accidental errors, laws of weights, theory of least squares, rules for giving weights and distribution of errors to the field observations, determination of the most probable values of quantities.	4	10
8	Curves: Introduction, classification of curves, Elements of a simple circular, designation of curve, methods of setting out a simple circular curve, elements of a compound and reverse curves, transition curve, types of transition curves, combined curve, types of vertical curves.	5	12
9	Surveying with GPS& DGPS Survey: Introduction of GPS: Concepts, Mechanism and Pre requirements of the GPS Survey, Coordinate and time systems, Satellite orbital motions, GPS observables, Estimation procedures, Propagation medium, Methods of post processing GPS data, Instrument handling and setting, Field work, Survey data post processing, Survey data applications. Introduction to Differential GPS (DGPS): Principle, Concepts and Function, Dual and Single Frequency DGPS	3	5
10	Total Station and Survey: Introduction to Total Station, Principle and Function, REM, RDM, Use of Total station for data processing and analysis, Field work: Point data collection (Easting, Northing and Height), Electronic Distance Measurement Survey, Area Measurement Survey Height Measurement Survey, Survey Data Post Processing, Survey Data Applications.	3	5

Course Outcome:

- 1 Conduct Plane table, Theodolite, Trigonometric levelling, Tachometric, Geodetic survey at identified site
- 2 Set out simple and transition curve at given location.
- 3 Compute area and volume using standard rule and equipments such as Planimeter.
- 4 Apply principles of theory of error for correction of measurements.
- 5 Conduct the survey by modern tools such as Digital Level, Total station, GPS



List of Experiment

1. Plane table traversing by intersection and radiation methods
2. Horizontal angle measurement using theodolite
3. Vertical Angle measurement using Theodolite
4. Theodolite traversing and plotting of traverse by applying corrections in Gale's traverse table
5. Techeometry Survey Project.
6. Setting out simple circular curve by different methods
7. Computation of area of submergence and storage volume from contour maps for reservoir projects.
8. Introduction to modern surveying Instruments.

List of Text Books:

1. Title: Surveying and Levelling, Author: Basak, N. N. (1994);, Publisher: Tata McGraw-Hill Education, Delhi
2. Title: Surveying and Levelling Author: Bhavikatt , S. S. (2009);, Publisher: I. K. International, New Delhi

List of Reference Books:

1. Title: Surveying, Vol. I & II, Author: Dr. B. C. Punmia, Ashok K. Jain, ArunK.Jain , Publisher: Laxmi Publications.
2. Title: Surveying and Levelling by Author: Subramanian, Publisher: Oxford University Press.
3. Title: Surveying, Vol. I & II Author: S. K. Duggal, Publisher: TataMc-Graw Hill.
4. Title: Surveying Vol. I & II Author: Dr. K. R. Arora , Publisher: Standard Book House.
5. Title: Surveying: Theory and Practice Author: James M. Anderson, Edward M. Mikhail, Publisher: Tata McGraw Hill.
6. Title: Surveying theory and practices Author: Devis R. E., Foot F. S.
7. Title: Plane and Geodetic surveying for Engineers. Vol. I Author: David Clark, Constable.
8. Title: Principles of Surveying. Vol. I Author: J. G. Olliver, J. Clendinning – Van Nostrand Reinhold.

Open e-Resource:

1. <http://nptel.ac.in/courses/105107122/>
2. <http://nptel.ac.in/courses/105107157/>
3. <http://nptel.ac.in/courses/105101087/>
4. <http://nptel.ac.in/courses/105104100/>
5. www.svnit.ac.in



Gandhinagar Institute of Technology (01)
Bachelor of Technology
Civil Engineering Department
4th Semester

Subject Code: 10020406	Subject Title: Building Planning
Pre-requisite: Fundamentals of Civil Engineering, Engineering Drawing Practices and Basics of Computer	

Course Objective:

- To develop students' ability to read, interpret, and prepare building drawings with proper detailing

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
2	0	4	4	70	30	30	20	150

Subject Contents				
Sr. No	Topic	Total Hours	Weight (%)	
1.	Introduction to buildings, detailed study of principles of building planning (with case study), Orientation of building, Principles of architecture composition.	4	10	
2.	Building by-laws as per National Building Code, Building by-laws of local authority, Standards for Residential, Public, Commercial, Industrial and Institutional buildings planning. Planning of earthquake resistant buildings considering symmetry, simplicity, continuity, consideration of locating staircase and overhead water tank, most sensitive to earthquake	8	30	
3.	Elements of Building Drawing, Planning and preparing working drawing of residential building with scale proportion, Layout of public building, Industrial building etc., Methods of making line drawing and detailed drawing. Site plan, floor plan, elevation and section drawing of small residential buildings, Foundation plan, Roof drainage plans. Provision of Building services (like water supply, drainage, electrification, etc.), software application in building planning and building Drawing for 2D model generation	8	30	
4.	Elements of perspective views, Types of perspective views, software application in building planning and building Drawing for 3D model generation.	4	20	
5.	Introduction to town planning, Historical aspects and origin of Town Planning in the World and in India, Necessity of Civic surveys for Planning purpose,	4	10	



	types, data and its presentation and analysis, Fundamental principles of Town Planning, Use of Soft Computing Tools for Town Planning		
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Suggested Specification table with Marks

Distribution of Theory Marks					
R	U	A	N	E	C
20%	40%	30%	10%	0	0

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

Course Outcome:

After learning the course the students should be able to:

1. Explain the principles of building planning, orientation, and architectural composition through examples and case studies.
2. Interpret and apply building by-laws from NBC and local authorities to residential, public, and industrial buildings.
3. Analyze earthquake-resistant planning features with respect to structural symmetry, simplicity, and service placement.
4. Prepare working drawings (site plan, floor plan, elevation, section, foundation plan, service plans) for small residential and public buildings using manual and software methods.
5. Demonstrate perspective drawing techniques and basic town planning principles using conventional and digital tools.

List of Reference Books:

1. *Title: Building Drawing with an Integrated Approach to Built Environment Author: M.G. Shah, C.M. Kale and S.Y. Publisher: McGraw Hill Education, India Pvt. Ltd.*
2. *Title: Building planning, designing and scheduling, Author: Gurucharan Singh, Publisher: , Standard Book House, New Delhi.*
3. *Title: Planning and Designing of Residential Building Author: Y.N. Raja Rao Publisher: Standard Publishers.*
4. *Title: Drawing and Design of Residential and Commercial Buildings Author: S. K. A. Zaidi and S.D. Siddiqui Publisher: Standard Publishers.*
5. *Title: Town Planning Author: S.C. Rangwala Publisher: Charotar Publishing House, Anand.*

Open e-Resource:

1. https://onlinecourses.nptel.ac.in/noc21_ar12/preview

List of suggested Practical/Tutorials:

1. Study of submission and detailed drawings
2. Planning of residential buildings
3. Preparation of submission and detailed drawings for residential buildings



4. Perspective drawing: one point and two point
5. Planning of public buildings
6. Development of the town planning scheme



Gandhinagar Institute of Technology (01)
Bachelor of Engineering
Civil Engineering Department
4th Semester

Subject Code: 10020407	Subject Title: Geotechnics & Applied Geology
Pre-requisite: Geological cycle, Basic rock types, Properties of material, Fundamental knowledge of engineering mathematics, Knowledge of principles of mechanics	

Course Objective:

- Geotechnics is required to equip the students to understand the properties and behavior of soil for the design of structures. To introduce students with basic principles of geosciences and their applications in civil engineering.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	0	2	4	70	30	30	20	150

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1.	Origin and Nature of Soil Definition, brief history, scope, and limitations of Geotechnics, Geological cycle, Physical and chemical agencies for soil, Formation - residual, transported, cumulose, alluvial, marine, and lacustrine, loess and colluvial soils. General characteristics of different types of soils. Overview of different types of soils in Gujarat / India. Index Properties, Relationships and Tests: Phase diagram, Basic terms and definitions, Functional relationships, Determination of index properties, Relative density for granular soil. Particle Size Analysis: Size and nomenclature of soil particles as per BIS, Sieve analysis, Sedimentation analysis, Particle size distribution curve and its uses.	10	30
2.	Soil Structure: Shape of the particles, Texture, and structure of the soil. Types of structure, properties, conditions for the formation of different structures. Soil Consistency:	8	20



	Consistency limits and its determination, different indices, Field moisture equivalent, Activity, Sensitivity & Thixotropy of soil. Soil Classification: Objectives, Basis, Textural, Unified soil classification, IS classification method, group index. Field identification and General characteristics of the soil. Soil Water: Free water and held water, Structural water and absorbed water, Capillary		
3.	Permeability and Seepage: Darcy's law and its validity, Factors affecting permeability, Laboratory permeability tests, Introduction to field permeability test, Permeability of stratified soil masses, Laplace equation (2 -D), Seepage pressure, Quick condition, Flow net, its characteristics and application.	07	10
4.	Physical Geology: Branches and scope of Geology; Surface processes and landforms: Weathering and Erosion; Introduction to geological agents (river, wind, oceans, glaciers, groundwater) and their actions (erosion, transport and deposition). Interior of the Earth: internal structure of earth, study of core, mantle and crust of the Earth. Processes responsible for volcanism (Process of volcanic eruption, types of volcanoes and volcanic hazard) and earthquake (Causes of earthquake occurrence, Distribution (seismic zoning), Seismo-tectonic setup of India, seismic hazard: Tsunamis, Active fault rupture, liquefaction). Plate Tectonics: Introduction to the concept of plate tectonics, mechanism responsible for plate movement, types of plate boundaries, processes and features associated with plate boundaries. Continental drift and sea floor spreading.	07	10
5.	Mineralogy and Petrology: Physical properties of minerals, major rock forming minerals, occurrence and use of minerals. Introduction to major rock types (Igneous, sedimentary and metamorphic rocks); their genesis, classification and structures; engineering properties of rocks, advantages and disadvantages of different rock types at constructions sites. Structural geology: Introduction to primary and secondary geological structures. Study of geological faults, folds, joints and active faulting. Their origin, types and engineering consideration. Geological mapping: study of Strike and dip using models and numerical problems, preparation of geological cross section.	10	30



Suggested Specification table with Marks

Distribution of Theory Marks					
R	U	A	N	E	C
20%	20%	20%	10%	10%	20%

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

Course Outcome:

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

1. Students will be made familiar with the internal structure of the Earth, its properties, and processes. Determine the index properties and interrelationships between various soil parameters.
2. Students will understand forces acting upon the surface of the Earth. Students will be able to appreciate processes and geological agents involved in the shaping surface of the earth and will learn about the landforms produced because of these processes.
3. Know types of soil water found in nature, its permeability characteristics and seepage determination. Know soil formation, types of soils, types of soils found in various parts of India.
4. Students will be able to know about hazards due to volcanic and seismic activity. Students will be able to identify major mineral and rock types in hand-specimen.
5. Students will become familiar with the different types of geological structure and understand hazard associated with their presence at site. Students will be able to predict the likely engineering behaviour of rocks under specified geologic conditions.

List of Reference Books:

1. Title: Soil Mechanics & Foundation Engineering Author: Murthy V. N. S. Publisher: Dhanpat Rai, Engineering.
2. Title: Soil Mechanics & Foundation Engineering Author: Alamsingh Publisher: CBS Publishers & Distributors, Delhi.
3. Title: Basic & Applied Soil Mechanics Author: Gopal Ranjan & Rao A. S. R. Publisher: New Age International Publishers.
4. Title: Principles of Geotechnical Engineering Author: Das Braja M Publisher: Thomson Asia Pvt. Ltd
5. Title: Soil Mechanics and Foundation Engineering Author: P. Purushothama Raj Publisher: Pearson Education.
6. Title: Fundamentals of Soil Mechanics Author: Taylor D.W. Publisher: Asia Publishing House, Mumbai.
7. Title: Soil Mechanics & Foundation Engineering Author: Arora K. R. Publisher: Standard Publications.
8. Title: Soil Mechanics & Foundations Author: Punmia B. C. Publisher: Laxmi Publications.
9. Title: Structural Geology of Rocks Author: G. H. Davis, Stephen J. Reynolds and Charles F. Kluth, Publisher: 3rd Edition, Wiley 2012.
10. Title: Engineering Geology Author: F. G. Bell, Publisher: Elsevier Ltd, 2007.

Open e-Resource:

1. https://onlinecourses.nptel.ac.in/noc23_ce84/preview



2. <https://archive.nptel.ac.in/courses/105/101/105101201/>
3. <http://www.nptel.iitm.ac.in/courses/>

List of Suggested Experiments:

1. Visual identification and specific gravity.
2. Sieve Analysis.
3. Hydrometer Analysis.
4. Liquid Plastic Limit Test.
5. Shrinkage limit Test.
6. Proctor Compaction Test.
7. Relative Density.
8. In site Density-Core Cutter & Sand Repl.
9. Permeability Test: Constant and Variable Head

Building Construction (10020408)

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
				Theory		Practical		Total
Lecture	Tutorial	Practical	Credit	University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	0	2	4	70	30	30	20	150

Subject Objective (Course Learning Objectives):

- To equip the students with the comprehensive methods of structural analysis with emphasis on analysis of elementary determinate structures.
- This subject is conceptual applications of principles of mechanics of rigid and deformable bodies in Engineering.
- This subject helps in determining statics response of statically determinate structures. In addition to this, the topics related to stability checks for structure subjected to lateral loads, buckling behaviour will also help the students in developing the basic concepts of structural analysis.

Pre-requisites: Fundamental of civil engineering

Linkages with other Subjects (Courses): Building Planning

Unit No.	Unit Title	Topics	Teaching Methodology
1	Introduction	Classification of buildings, Components of buildings and their broad functions, Types of building & Building system, Frame structure, Load bearing, Steel Structure etc.	PPT, Chalk & Duster
2	Foundation	Open excavations, braced excavations, Functions, Classification, Damp proofing in building construction	PPT, Chalk & Duster
3	Masonry Construction	a) Stone masonry: Technical terms, lifting appliances, joints, types – random (un-coursed) rubble, coursed rubble, dry rubble masonry, Ashlar masonry- Ashlar fine, chamfered fine. b) Brick masonry: Technical terms, bonds in brick work- English bond, single & double Flemish bond, garden wall bond, raking bond, Dutch bond. c) Composite masonry: Stone facing with brick backing, brick facing with concrete backing. d) Hollow concrete blocks and construction e) Cavity walls: Brick cavity walls, position of cavity at foundation, roof and at opening levels. f) Lintels & arches: Lintels – types, construction. Arches– technical terms, types of brick arches, rough, axed, stone arches, flat semi circular	PPT, Chalk & Duster
4	Doors and Windows	a) Doors: Location, technical terms, size, types, construction, suitability. b) Windows: Factors affecting selection of size, shape, location and no. of windows, types, construction, suitability, fixtures and fastenings. c) Ventilators: Ventilators combined with window, fan light.	PPT, Chalk & Duster
5	Stairs and Staircases	Definition, technical terms, requirements of good stair, fixing of going and rise of a step, types of steps, classification, elevators, escalators.	PPT, Chalk & Duster
6	Floorings	Introduction, essential requirements of a floor, factors affecting selection of flooring material, types of ground floors, brick, flag stone, tiled Cement concrete, granolithic, terrazzo, marble, timber flooring, upper floor. Timber, timber	PPT, Chalk & Duster

		floor supported on RSJ flag stone floor resting on RSJ, jack arch floor, reinforced concrete floor, ribbed floor, pre cast concrete floor	
7	Roofs and Roof Coverings	Introduction, requirements of good roof technical terms, classification, types of roof coverings for pitched roof. A.C. sheet roofs – fixing of A.C. sheets, laying of big six sheets, G.I. Sheets roofs, slates, flat Roof – advantages, dis -advantages, types of flat terraced roofing.	PPT, Chalk & Duster
8	Special Works	Timbering in trenches, Control of Ground water in excavation, types of scaffoldings, shoring, underpinning, Cofferdams, Diaphragm Walls, Demolition of structures. Special Treatments: Fire resistant, water resistant, thermal insulation, acoustical construction and anti-termite treatment	PPT, Chalk & Duster
9	Green Building	Green Building as a solution to sustainable future, rating system for green building. Principles, Concepts and Case study	PPT, Chalk & Duster

List of Tutorial:

Tut. No.	Tutorial Title
1	Introduction
2	Foundations
3	Masonry Construction
4	Doors and Windows
5	Stairs and Staircases
6	Floorings
7	Roofs and Roof Coverings
8	Sheet 1: Drawings of all the components of Masonry Construction (Brick masonry, bonds and junctions) (A2 Size Sheet)
9	Sheet 2: (a) Foundation (b) Doors & Windows (c) Stairs (d) Truss (A2 Size Sheet)

Subject Teaching Materials:

Lectures, lecture notes, and materials, web-ready content

Virtual Laboratory:

1. National Building Code of India - 2016: Vol.-1 & Vol.-2, Bureau of Indian Standards, New Delhi
2. Corresponding set of CAD Software Theory and User Manuals
3. Guide to RERA with RERA check list by Texman publications

Text Books:

1. Title: Building Construction Author: Dr. B.C. Punamia Publisher: Laxmi Publication-Delhi.
2. Title: Civil Engineering Drawing, Building Construction Author: Gurucharan Singh & S.C. Rangwala Publisher: Charotar Publication.

Reference Books:

1. Title: Building Construction Author: S.C Rangwala Publisher: Charotar Publication
2. Title: Building Construction Author: Sushil Kumar Publisher: Standard Publisher
3. Title: The Construction of Building Author: R. Barry Publisher: ELBS
4. Title: Building Construction Handbook Author: Chudly&Greeno
5. Indian Standard Institution, National Building Code of India, ISI, 1984, New Delhi

Program Educational Objectives (PEOs):

Sr. No.	PEO Statement
PEO-1	The development of a basic understanding about the construction of different type of Structures and application.
PEO-2	The development of the basic principles of Engineering to solve real life problems in construction practices is necessary for civil engineers.
PEO-3	To make the students aware of the various techniques and practices on various stages of building construction and careful selection of suitable construction components.
PEO-4	To learn current building drawing practices for various building Components.

Course Outcomes (COs):

Sr. No.	CO Statement
CO1	Student able to develop in- depth understanding about construction materials, building components, its construction process etc., and apply the knowledge to execute normal sized building construction project.

CO2	Student can recognize the associated entities involved in building construction process.
CO3	Student can identify the factors to be considered in planning and construction of buildings.
CO4	Student able to apply learning to further research in sustainable civil engineering materials, Construction technology and construction management field.

Mr. Neel K. Shah
Subject Coordinator

Dr. Sandesh Sharma
HoD

Gandhinagar Institute of Technology (01)
Bachelor of Technology
Civil Engineering Department
4th Semester

Subject Code: 10020409	Subject Title: Theory of Structures- I
Pre-requisite: Mechanics of Solid	

Course Objective:

- (1) To equip the students with the comprehensive methods of structural analysis with emphasis on analysis of elementary determinate structures.
- (2) This subject is conceptual applications of principles of mechanics of rigid and deformable bodies in Engineering.
- (3) This subject helps in determining statics response of statically determinate and indeterminate framed structures. In addition to this, the topics related to stability checks for structure subjected to lateral loads, buckling behaviour will also help the students in developing the basic concepts of structural analysis.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	1	0	4	70	30	00	00	100

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Fundamentals of Statically Determinate Structures: Types of statically determinate & indeterminate structures, static and kinematic indeterminacy, stability of structures, principle of superposition, Maxwell's reciprocal theorems. Computation of internal forces in statically determinate structures such as plane truss, plane frame, grids.	10	25%
2	Strain Energy: Resilience, Strain Energy in Tension Compression, Bending and Torsion, Proof Resilience, Impact Loads	5	12%
3	Direct and Bending Stresses: Short Columns subjected to eccentric load, Middle Third Rule, Kernal (Core) of Section	4	8%

4	Columns and Struts: Buckling of Columns, different end conditions, effective length, least radius of gyration, Euler's Theory of Long Columns – its applicability and limitations, Rankine's Formula, Secant Formula	5	12%
5	Slope and Deflection of Statically Determinate Beams: Differential Equation of the Elastic Curve, fundamental Double Integration Method, Macaulay's Method, Moment Area Method, Conjugate Beam Method, Unit Load Method and Castigliano's First Theorem	14	35%
6	Thin Cylinder: Analysis of thin cylinder and spherical vessels under pressure.	4	8%

Specification table with Marks:

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

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

Course Outcome:

After learning the course the students should be able to

1. The students have advanced knowledge of methods of analysis for determining simple structures.
2. Apply principles of statics to determine reactions & internal forces in statically determined structures.
3. Determine displacements of statically determined structures.
4. Determine stresses due to axial & eccentric loading.
5. Determine buckling load for columns & struts with different end Conditions.
6. Determine strain energy stored in a body.

List of Reference Books:

1. *Title: Mechanics of Structures Vol-I, Junarkar Author: S.B. & Shah H.J, Publisher: Charotar publishing house, Anand*
2. *Title: Strength of Materials, Author: Ryder G.H, Publisher: Mcmillan*
3. *Title: Engineering Mechanics of Solids, Author: Popov E.P., Publisher: Prentice Hall of India, New Delhi*
4. *Title: Intermediate Structural Analysis, Author: Wang C. K, Publisher: Tata McGraw Hill book Company, New Delhi*
5. *Title: Mechanics of Materials, Author: Gere & Timoshenko, Publisher: CBS Publishers & Distributors, Delhi*
6. *Title: Mechanics of Materials, Author: Hibbler R C, Publisher: Pearson Education*
7. *Title: Structural Analysis, Author: Hibbler R C, Publication: Pearson Education*

Open e-Resource:

https://onlinecourses.nptel.ac.in/noc23_ce88/preview

List of Suggested Tutorials:

- (1) Statically Determinate Structures
- (2) Strain Energy
- (3) Direct and Bending Stresses
- (4) Columns and Struts
- (5) Slope and Deflection of Statically Determinate Beams
- (6) Thin Cylinder



Gandhinagar Institute of Technology (01)
Bachelor of Technology
Civil Engineering Department
5th Semester

Subject Code: 10020503	Subject Title: Highway Engineering
Pre-requisite: Basic knowledge of Transportation Engineering	

Course Objective:

- Design simple roads for connecting towns and villages in hilly and plain areas.
- Supervise testing of materials, construction of roads including highways.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	0	2	4	70	30	30	20	150

Subject Contents				
Sr. No	Topic	Total Hours	Weight (%)	
1.	Introduction: Scope of highway engineering, Highway planning, and development in India, Classification of rural and urban roads, Road patterns, Planning, and alignment surveys.	3	10	
2.	Highway geometric design: Cross-sectional elements – width, surface, camber, Sight distances – SSD, OSD, ISD, HSD, Design of horizontal and vertical alignment – curves, super-elevation, widening, gradients, summit, and valley curves	10	22	
3.	Highway materials: subgrade soil, aggregates, binder materials, bituminous materials, bituminous paving mixes, cement and cement concrete – their engineering and physical properties, basic tests	7	16	
4.	Pavement Design: factors, Design of flexible (GI and CBR method) and rigid pavements (fatigue concept), Construction of earthen, Gravel, WBM, Bituminous, Cement concrete, RCC and Pre-stressed concrete roads, Soil	7	16	



	stabilized roads		
5.	Pavement failures: Maintenance, Surface and sub-surface drainage, Hill roads – alignment, construction, drainage, and maintenance. Roadside development – arboriculture, street lighting. Highway administration, economics and finance, road safety audit	6	16
6.	Traffic engineering: basic elements, road users - vehicles - traffic flow characteristics, speed – volume studies, surveys, parking studies, Accident studies: causes, collision and condition diagrams, preventive measures, Traffic control: markings, signs, signals, intersections, rotaries.	9	20

Suggested Specification table with Marks

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

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

Course Outcome:

After learning the course the students should be able to:

1. Know about highway planning and its classification
2. Carryout geometric design of highway
3. Carryout survey of classified traffic volume count and spot speed study on highway, working of different traffic control devices, carryout laboratory tests on aggregates and bituminous materials.
4. Carryout preliminary design of flexible and rigid pavement, know about pavement failures, its maintenance, the importance of drainage, hill roads, and their challenges.

List of Reference Books:

1. *Title:* "Highway Engineering", *Author:* L.R. Kadiyali, *Publisher:* Khanna Publishers, New Delhi.
2. *Title:* "Traffic Engineering and Transport Planning", *Author:* L.R. Kadiyali, *Publisher:* Khanna Publishers, New Delhi.
3. *Title:* "Highway Engineering", *Author:* Dr. S.K. Khanna and Dr. C.E. G. Justo, *Publisher:* Nem Chand & Bros., Roorkee.
4. *Title:* "Principles, Practice and Design of Highway Engineering", *Author:* S.K. Sharma, *Publisher:* S. Chand & Co., New Delhi.

IRC Codes:

1. IRC – 37 "Guidelines for Design of flexible Pavements", IRC, New Delhi, 2001.
2. IRC – 67 "Code of Practice for Road Signs", IRC, New Delhi – 2001.
3. IRC: 58, 2002: "Guidelines for the Design of Plain Jointed Rigid Pavements for Highways", IRC, N. Delhi, December, 2002.

**Open e-Resource:**

1. <https://www.irc.nic.in/>
2. <https://crridom.gov.in/node/1>
3. www.nptel.iitm.ac.in
4. <https://nhai.gov.in/>

List of Suggested Experiments:

1. Introduction to Highway Engineering Laboratory Equipment.
2. Speed Studies of Fast And Slow Vehicles
3. Parking Study By In-Out Survey
4. Standard Test Procedure For Benkelman Beam Deflection Measurements
5. Determination Of Aggregate Crushing Value
6. Impact test for Aggregate
7. Los Angeles Abrasion test for Aggregate
8. Flakiness and Elongation test for Aggregate
9. Penetration test for Bitumen
10. Ductility test for Bitumen
11. Softening point test for Bitumen
12. Flash and Fire test for Bitumen



Gandhinagar Institute of Technology (01)
Bachelor of Technology
Civil Engineering Department
5th Semester

Subject Code: 10020508	Subject Title: Remote Sensing and GIS
Pre-requisite: Zeal to learn subject.	

Course Objective:

- To develop a basic understanding about Geo-Spatial techniques and its applications.
- To enable the students to apply the tools to solve various problems related to Civil Engineering.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	0	2	4	70	30	30	20	150

Subject Contents				
Sr. No	Topic	Total Hours	Weight (%)	
1	Fundamental of remote sensing Definition –Components of Remote Sensing –Active and Passive Remote Sensing – Electro Magnetic Spectrum – Interaction of EMR With the Earth's Surface – Interactions with the Atmosphere Energy Sources and Radiation. Active and Passive Remote Sensing. Energy Interaction with the Earth Surface Features. Data Acquisition and Recording. Remote Sensing Data Products.	05	20	
2	Image interpretation and digital image processing: Introduction to Digital Image and Imaging Sensors- Data Formats of Digital ImageDisplay of Digital Image - Image Processing Systems – Strategies – Keys – Equipment – Fundamentals of Image Classification and Analysis.	04	10	



3	Geographic information system: Introduction to GIS- Definitions of GIS and related terminology - Components of GIS – GIS Data – Georeferenced data – introduction to data input and output in GIS– Fundamentals of data quality and Management	06	25
4	Spatial data analysis: Introduction to Map projections- Geo-referencing Frameworks and Reference Coordinate Systems. GIS analysis functions – Retrieval – Reclassification – Buffering and Neighborhood – Overlaying – Data Output – Fundamentals of GIS Analysis functions	06	25
5	Software: GIS and Image interpretation Software – Salient features – Capabilities and Limitations. Data management in public domain GIS software- Attribute Data Management	04	10
6	Applications: Application of Remote Sensing / GIS– Case studies. GIS and Remote Sensing – Usefulness in Civil Engineering.	03	10

Suggested Specification table with Marks

Distribution of Theory Marks					
R	U	A	N	E	C
10%	10%	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)

Course Outcome:

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

1. Observe, Identify and define simple/ complex problems of day to day lives present in Industry/ Society where GIS and Remote Sensing applications can be useful.
2. Apply knowledge of basic image interpretation and data image processing.
3. Integrate the existing data through various observations from various angles and layer creation.
4. Apply problem-solving methodologies to generate, evaluate and justify innovative solutions by designing and conducting/ analyzing and interpreting the data.
5. Demonstrate the ability to give solutions with an ability which can help communicate effectively for giving better interpretation and solutions.

List of Reference Books:

1. Title: Lilliesand T.M. and Kiefer R.W., Remote Sensing and image Interpretation, John Wiley and Sons, New York, 2004.



2. Title: Burrrough P.A and McDonnel R.A., Principles of Geographic Information Systems, Oxford university press, 1998
3. Title: Lo C.P. and Yeung Albert K.W., Concepts and Techniques of Geographical Information Systems, Prentice-Hall of India Pvt. Ltd. New Delhi, 2006
4. Title: Manual of Remote Sensing (Edited), Series of volumes.
5. Title: A.M. Chandra and S.K. Ghosh, Remote Sensing and Geographical information System, Narosa Publishing House, New Delhi, 2006
6. Title: Agrawal N.K., Essentials of GPS, Spatial Network Pvt. Ltd., Hyderabad, 2004.
7. Title: Bhatta B., Remote Sensing and GIS, Oxford University Press, New Delhi, 2008

Open e-Resource:

1. <http://nptel.ac.in/>
2. <http://ocw.mit.edu/courses/civil-and-environmental-engineering>

List of Tutorials/Activities:

1. Projects on Water Resource Mapping and Management.
2. Projects on Land Use Mapping and LandResource Management.
3. Projects on Site Selection for major infrastructure.
4. Projects on Natural Disaster Mitigation and Management.

Gandhinagar Institute of Technology (01)
Bachelor of Technology
Civil Engineering Department
5th Semester

Subject Code: 10020509	Subject Title: Soil Mechanics
Pre-requisite Strength of Materials and Fluid Mechanics, Fundamental knowledge of engineering mathematics, Knowledge of principles of mechanics.	

Course Objective:

1. Soil Mechanics is a very fundamental subject consisting of determination of various soil parameters theoretically and experimentally based on laws of mechanics.
2. Any civil engineering structure needs a strong and stable foundation which depends on proper understanding of soil behaviour, determination and interpretation of soil parameters, determination of stresses in soil.
3. The course on Soil Mechanics provides the students with basic knowledge on soil properties, testing procedures, suitability of test and analytical solutions necessary for design and behaviour of soil.
4. Soil Mechanics is a very fundamental subject consisting of selection of proper type of foundation as per sub-soil profile and type of structure.
5. Various types of foundation and their analytical solution helps the student to design suitable foundation with respect to soil and site condition.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	University Assessment	University Assessment	University Assessment	
3	0	2	4	70	30	30	20	150

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Subsurface Investigation: Types of foundation, Factors affecting the selection of type of foundations, steps in choosing types of foundation. Objectives of exploration, planning of exploration program, soil samples and soil samplers, field penetration tests:	10	30

	SPT, SCPT, DCPT. Introduction to geophysical methods, bore log and report writing. Stress Distribution of Soils: Causes of stress in soil, geostatic stress, Boussinesque's equation, stress distribution diagrams, Newmark's influence chart Westergaard's equation, contact pressure, stresses due to triangular and other loadings.		
2	Stability of Slopes: Infinite and finite slopes, factor of safety, type of slope failure, stability of infinite slopes, finite slopes forms of slip surfaces, limit equilibrium method and critical stage instability analysis, effects of tension crack and submergence, C-analysis-method of slices, Taylor's stability no., use of Bishop's method.	06	10
3	Earth Pressure: Types of lateral earth pressure, Rankine's and Coulomb's earth pressure, theory and their application for determination of lateral earth pressure under different conditions, Rebhann's and Culmann's Graphical methods of determination of lateral earth pressures.	06	10
4	Bearing Capacity of Shallow Foundation: Introduction, significant depth, design criteria, modes of shear failures. Detail study of bearing capacity theories (Prandtl, Rankine, Terzaghi, Skempton), bearing capacity determination using IS Code, Presumptive bearing capacity. Settlement, components of settlement & its estimation, permissible settlement, Proportioning of footing for equal settlement, allowable bearing pressure. Bearing capacity by use of penetration test data and by plate load test. Bearing capacity of raft. Factors affecting bearing capacity including Water-Table. Contact pressure under rigid and flexible footings. Floating foundation. Types of pavements & its design	10	30
5	Pile foundations: Introduction, load transfer mechanism, types of piles according to their composition, their method of installation and their load carrying characteristics, piles subjected to vertical loads- pile load carrying capacity from static formula, dynamic formulae (ENR and Hiley), penetration test data & Pile load test. Pile group: carrying capacity, efficiency and settlement. Negative skin friction. Underreamed pile foundation-its concept, design & field installation	10	20

Suggested Specification table with Marks

Distribution of Theory Marks					
R	U	A	N	E	C
20%	10%	20%	20%	10%	20%

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

Course Outcome:

After learning the course the students should be able to:

1. The course also discusses details of foundations, its selection procedures as per soil conditions and various modifications available for various degrees of loads.
2. The course covers various topics like compaction, shear strength, consolidation, earth pressure, stress distribution which gives insight to students to analysis soil parameters based on application and need of project site.
3. Select appropriate soil investigation/testing technique/method and get true sub soil parameters used for selection of type of foundation as per codal guidelines.
4. The course will also develop an understanding of soil testing procedures, experimentation techniques and related issues. Simulation of mechanics on soil as a material to understand its behaviour before failure and estimating its permissible values.
5. Design deep foundation satisfying bearing capacity and settlement requirements, Design, and analysis of retaining walls and sheet piles under static loads.

List of Reference Books:

1. Title: Soil Mechanics & Foundation Engineering Author: Murthy V. N. S. Publisher: Dhanpat Rai, Engineering.
2. Title: Soil Mechanics & Foundation Engineering Author: Alamsingh Publisher: CBS Publishers & Distributors, Delhi.
3. Title: Basic & Applied Soil Mechanics Author: Gopal Ranjan & Rao A. S. R. Publisher: New Age International Publishers.
4. Title: Principles of Geotechnical Engineering Author: Das Braja M Publisher: Thomson Asia Pvt. Ltd
5. Title: Soil Mechanics and Foundation Engineering Author: P. Purushothama Raj Publisher: Pearson Education.
6. Title: Soil Mechanics & Foundation Engineering Author: Arora K. R. Publisher: Standard Publications.
7. Title: Soil Mechanics & Foundations Author: Punmia B. C. Publisher: Laxmi Publications.

Open e-Resource:

1. https://onlinecourses.nptel.ac.in/noc22_ce96/preview
2. <https://archive.nptel.ac.in/courses/105/101/105101201/>
3. <http://www.nptel.iitm.ac.in/courses/>

List of Suggested Experiments:

1. Proctor Compaction Test
2. Standard penetration Test
3. Model pile load Test
4. CBR Test
5. Oedometer test
6. Direct Shear Test
7. Unconfined Compression Test

8. Demonstration of Triaxial test
9. Auger boring/sampling
10. Free swell and swell potential

Gandhinagar Institute of Technology (01)
Bachelor of Technology
Civil Engineering Department
5th Semester

Subject Code: 10020510	Subject Title: Construction Planning Management and Equipment
Pre-requisite: Building Construction	

Course Objective:

- To understand the principles of construction project management including project planning, resource allocation, workload analysis, progress tracking, cost estimation, and budget management.
- To develop skills required for successful execution of construction projects, including management of complex works, safety, and quality control in construction.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	0	0	3	70	30	00	00	100

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Introduction: Features of Construction Projects, phases of construction project, Stakeholders of construction management.	2	5
2	Construction Project Planning Stages of project planning: Process of development of plans and schedules, work break-down structure, activity lists, assessment of work content, concept of productivities, estimating durations, sequence of activities, activity utility data. Techniques of planning- Bar charts, Line of balance, Milestone charts. Planning and organizing construction site and resources Site: Site layout including enabling structures, developing site organization. Manpower: Planning, organizing, staffing, motivation. Materials: Concepts of planning, procurement, and inventory control. Equipment: Basic concepts of planning and organizing.	18	45

	Funds: Cash flow, sources of funds. Histograms and S-curves, resource scheduling, allocation, smoothening and leveling, common good practices in construction. Networks: Basic terminology, types of precedence relationships, preparation of CPM networks: activity on arrow and activity on node representation, computation of float values, critical paths, and calendaring networks. PERT analysis, calculation of probability of completion.		
3	Project Monitoring & Control Network crashing and cost time trade off, Periodic progress reports and periodical progress meetings, purpose, frequency and methods of updating plans. Modern project management Systems: Lean construction; use of Building Information Modeling (BIM) in project management.	8	15
4	Quality Control: Concept of quality, quality of constructed structure, use of manuals and checklists for quality control, role of inspection, basics of statistical quality control, CONQUAS- Construction Quality Assessment System Construction Safety management: Evolution of safety, Accident causation theory, Unsafe conditions, Unsafe acts health and safety act and regulation cost of accidents, Role of safety personnel, Accident causes and principles of safety, Safety and health management system.	5	10
5	Construction Equipment: Conventional construction methods Vs Mechanized Methods Equipment: Capacity, Feasibility, owning and operating cost and Productivity of Different Equipment: Earthmoving, dewatering, concrete mixing, lifting, transporting & placing, pile boring/driving equipment, tunnel boring machines.	12	25

Suggested Specification table with Marks:

Distribution of Theory Marks					
R	U	A	N	E	C
5%	10%	25%	30%	30%	0

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

Course Outcome:

After learning the course the students should be able to:

1. Outline components and phases of construction project.
2. Infer types of project plans, Work break down structure, Planning techniques, CPM and PERT techniques project scheduling & management.
3. Illustrate periodic progress reports, Updating of plans, Cost Optimization.
4. Derive evaluation criteria and attributes for Construction Projects

List of Reference Books:

1. *Title:* Construction Planning, Methods and Equipment, *Author:* R.L. Peurifoy, *Publisher:* McGraw Hill, 2011.
2. *Title:* Construction Project management, Theory & Practice, *Author:* Kumar Neeraj Jha, *Publisher:* Pearson Education India.
3. *Title:* Project Planning with PERT and CPM, *Author:* B. C. Punmia, K. K. Khandelwal, *Publisher:* Laxmi Publications.
4. *Title:* Construction Planning and Management, *Author:* P. S. Gehlot and B. M. Dhir, Wiley *Publisher:* Eastern Ltd.
5. *Title:* A management guide to PERT/ CPM, *Author:* Weist and Levy, *Publisher:* Prentice Hall.
6. *Title:* Construction Equipment and its Planning and Application, *Author:* Mahesh Varma, *Publisher:* Metropolitan Book Co.
7. CONQUAS: The CIDB Construction Quality Assessment System by Singapore. Construction Industry Development Board
8. Occupational Safety, Health & Environment and Sustainable Economic Development by By Pradeep Chaturvedi (ed.), Concept Publishing Company Delhi

Open e-Resource:

1. <https://nptel.ac.in/courses/105104161>

Gandhinagar Institute of Technology (01)
Bachelor of Technology
Civil Engineering Department
5th Semester

Subject Code: 10020510	Subject Title: Theory of Structures- II
Pre-requisite: Mechanics of Solid, Theory of Structures- I	

Course Objective:

- (1) This subject is conceptual applications of principles of mechanics of rigid and deformable bodies in Engineering.
- (2) This subject helps in determining statics response of statically indeterminate framed structures.
- (3) In addition to this, the topics related to applications of Energy Principles, moving loads will help the students in developing the basic concepts of structural analysis.
- (4) Use of professional software in structural analysis is a need of the day and hence it is included in this course.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	1	0	4	70	30	00	00	100

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Statically Indeterminate structure – Classical methods: Slope Deflection Method: Analysis of continuous beams for various loading including settlement/ rotation of support, analysis of simple portal frame with sway. Moment Distribution Method: Analysis of plane frames including sway, use of symmetry of structure up to two storeyed / two bay frames.	10	25%
2	Statically Indeterminate structures – Matrix methods Matrix Methods: Types of skeletal structures, Internal forces and deformations. Introduction and applications of stiffness method to analyze beams, Trusses and plane frames by system approach. Introduction and applications of Flexibility method to analyze beams, Trusses and plane frames by system approach.	12	25%

3	Energy Principles + Approximate methods Energy Principles: Castigliano's theorems, Application of castigliano's 1 st and 2 nd theorem to statically determinate and indeterminate framed structure – beams, plane truss & plane frames. Approximate methods: Forces in the framed structure subjected to Vertical and lateral loads.	10	25%
4	Structure subjected to Moving loads Influence line diagrams ILD for statically determinate beams- I.L.D of support reaction, shear force and moment bending moment for beams subjected to u.d.l and several point loads, criteria for maximum effects, ILD for statically determinate trusses, forces in members for u.d.l and point loads. ILD for statically indeterminate beams: Muller-Breslau's principle, steps for obtaining I.L for reaction and internal forces in propped cantilever and continuous beams, qualitative I.L diagram for rigid jointed structures having higher degree of statical indeterminacy.	10	25%

Specification table with Marks:

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

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

Course Outcome:

After learning the course the students should be able to:

1. Determine response of statically determination & indeterminate structure by classical & matrix method.
2. Apply energy principles in determining response of statically determinate & indeterminate structures.
3. Compute approximate internal forces in framed structure subjected to vertical and lateral loads.
4. Determine internal forces and reactions in determinate and indeterminate structures subjected to moving loads.

List of Reference Books:

1. *Title: Intermediate Structural Analysis, Author: Wang C. K, Publisher: Tata McGraw Hill book Company, New Delhi*
2. *Title: Mechanics of Materials, Author: Gere & Timoshenko, Publisher: CBS Publishers & Distributors, Delhi*
3. *Title: Structural Analysis, Author: Hibbler R C, Publisher: Pearson Education*
4. *Title: Mechanics of Structures Vol-II, Junarkar Author: S.B. & Shah H.J, Publisher: Charotar publishing house, Anand*
5. *Title: Strength of Materials, Author: Ryder G.H, Publisher: Mcmillan*
6. *Title: Matrix Analysis of framed structures Author: Gere & Weaver, Publisher: CBS Publications*

Open e-Resource:

https://onlinecourses.nptel.ac.in/noc23_ce88/preview

List of Suggested Tutorials:

- (1) Slope Deflection Method
- (2) Moment Distribution Method
- (3) Matrix Methods
- (4) Energy Principles
- (5) Approximate methods
- (6) Influence line diagrams



GANDHINAGAR INSTITUTE OF TECHNOLOGY
Bachelor of Technology - Civil Engineering
Semester - V

Subject Code: 10020516	Subject Title: Disaster Management in Civil Infrastructure
Pre-requisite: NA	

Course Objective: This subject is conceptual applications of principles of management to mitigate various disasters.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	1	0	3	70	30	0	0	100

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Understanding Disasters Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Capacity – Disaster and Development, and disaster management	4	10
2	Types, Trends, Causes, Consequences and Control of Disasters Geological Disasters (earthquakes, landslides, tsunami, mining); Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves); Biological Disasters (epidemics, pest attacks, forest fire); Technological Disasters (chemical, industrial, radiological, nuclear).	6	15
3	Disaster Management Cycle and Framework Disaster Management Cycle – Paradigm Shift in Disaster Management Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Micro zonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development; Awareness During Disaster – Evacuation – Disaster Communication – Search and Rescue – Emergency Operation Centre – Incident Command System – Relief and Rehabilitation –	8	20



	Post-disaster – Damage and Needs Assessment.		
4	Disaster Management in India Disaster Profile of India – Mega Disasters of India and Lessons Learnt Disaster Management Act 2005 – Institutional and Financial Mechanism National Policy on Disaster Management, National Guidelines and Plans on Disaster Management; Role of Government (local, state and national), Non- Government and Inter-Governmental Agencies	10	25
5	Applications of Science and Technology for Disaster Management & Mitigation Geo-informatics in Disaster Management (RS, GIS, GPS and RS) Disaster Communication System (Early Warning and Its Dissemination) Disaster Safe Designs and Constructions Structural and Non-Structural Mitigation of Disasters, S&T Institutions for Disaster Management in India	12	30

Course Outcome:

- CO-1 Understand disasters, disaster preparedness and mitigation measures
- CO-2 Understand role of IT, remote sensing, GIS and GPS in risk reduction
- CO-3 Understand disaster management acts and guidelines along with role of various stakeholders during disasters

List of Text Books:

- Title: Natural Disaster, Author: Sharma, R.K. & Sharma, G. (2005) (ed), Publisher: APH Publishing Corporation, New Delhi.
- Title: Management of Natural Disasters in developing countries, Author: H.N. Srivastava & G.D. Gupta, Publisher: Daya Publishers, Delhi, 2006, 201 pages
- An overview on natural & man-made disasters and their reduction, R K Bhandani, CSIR, New Delhi

List of Reference Books:

- Manual on natural disaster management in India, M C Gupta, NIDM, New Delhi
- National Disaster Management Policy, 2009, GoI
- Disaster Management Act 2005, Publisher by Govt. of India
- Publications of National Disaster Management Authority (NDMA) on Various Templates and Guidelines for Disaster Management
- Disaster Preparedness Kit, American Red Cross

Open e-Resource:

- www.GIS.Development.net
- www.iirs.nrsa.org
- <http://quake.usgs.gov>
- www.nidmindia.nic.in



Gandhinagar Institute of Technology (01)
Bachelor of Technology
Civil Engineering Department
5th Semester

Subject Code: 10020514	Subject Title: Building Services
Pre-requisite: NA	

Course Objective:

- To develop proficiency in designing, sizing and selecting HVAC equipment
- To understand about MEPS plans of building

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
2	1	0	3	70	30	0	0	100

Subject Contents				
Sr. No	Topic	Total Hours	Weight (%)	
1.	Plumbing Systems Water storage and distribution, heating methods, pipe staking, dual plumbing, drainage system, maintenance, pipes and fittings, pipe sizing and selection for water supply and drainage, plumbing codes and standards.	2	5	
2.	Electrical Lighting and Illumination Systems Electrical system installations, electrical control and safety devices: fuse, circuit breakers, lightning arresters, Electrical wiring systems: material and specifications; Factors affecting illumination in building, modern theory of light and colour, synthesis of light, Luminous flux, utilization factor, artificial light sources, types of energy efficient lamps.	8	30	
3.	Heating, Ventilation and Air Conditioning (HVAC) Concept, importance, components, planning of HVAC systems. Basics of heat transfer: conduction, convection, radiation, Psychrometric properties and air conditioning processes, applications of Psychrometric charts, design principles of HVAC system, Renewable energy integration: solar heating, geothermal systems; green building standards	8	30	
4.	Vertical Transportation Importance, evolution of technology, role in building functionality and accessibility, Elevator: types, components, car design and interior considerations, functioning of escalators and moving walkways, safety regulations and codes for vertical transportation systems	4	15	
5.	Building Automation and Fire Safety System: Need, types and concept of smart building automation, Access control systems: biometrics, RFID, smart	6	20	



	cards, Intrusion detection systems, and perimeter security, Closed-circuit television (CCTV) and video surveillance, Integration of security systems for comprehensive protection, Causes of fire, fire resistance materials, safety regulations, fire-fighting devices and systems, fire escapes, Types of fire detection sensors: smoke, heat, flame detectors, Fire alarm systems and their components, Fire suppression systems: sprinklers, gas suppression, Design considerations for effective fire safety measures.		
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Suggested Specification table with Marks

Distribution of Theory Marks					
R	U	A	N	E	C
30%	20%	30%	30%	0	0

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

Course Outcome:

After learning the course the students should be able to:

1. Categories different types of pipes and fixtures used in plumbing installations.
2. Recommend suitable electrical and lighting system in buildings.
3. Function of vertical transportation in modern buildings and infrastructure
4. Assess appropriate safety and security systems in buildings.

List of Reference Books:

- Greeno R., *Building Services, Technology and Design*, Routledge publication
- Hassan G., *Building Services*, Macmillan.
- Hall, F. & Greeno, R. *Building Services Handbook*, Butterworth-Heinemann.
- Philips D., *Lighting Modern buildings*, Architectural Press
- Hall, F., *Building services and equipment*, Routledge
- Rao, S., Jain R.K. & Saluja, S., *Electrical Safety, fire safety Engineering and Safety Management*, Khanna Publishers.

Open e-Resource:

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

List of Suggested Tutorials:

1. To prepare A3 Size sheets for different types of building services.

Gandhinagar Institute of Technology (01)
Bachelor of Technology
Civil Engineering Department
5th Semester

Subject Code: 10020515	Subject Title: Sustainable Smart Cities
Pre-requisite: Environmental Studies	

Course Objective:

- (1) Understand the role of civil engineering in developing sustainable urban infrastructure, including smart mobility, energy systems, and waste management.
- (2) Reflect on how digital technologies like IoT, GIS, BIM, and AI are applied in urban planning and governance.
- (3) Identify and propose solutions to real-world urban challenges using a smart city framework.
- (4) Appraise the principles of urban resilience and disaster management in the context of city planning.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
2	1	0	3	70	30	00	00	100

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Introduction to Smart Cities Definition, concept and focus, Introduction to city planning, smart city philosophy and goal, dimensions of smart cities, green field, brownfield, concept of digital twin city.	08	20
2	Development of Smart Cities Criteria for selection and development of smart cities, contemporary issues of urban planning – Indian and global perspectives, urbanization and growth for cities, urban patterns and trends, evolution of smart cities, factors affecting the development of smart cities, effect of technology on the development of smart cities, human impact on smart city development, elements of smart city plan, law and legislations, role of stakeholders.	12	30

3	Smart Infrastructures Urban Infrastructure and overview on state of urbanization. Elements of smart infrastructures: ICT, energy, transportation, buildings, people, water, waste management; smart city/infrastructure design principle, challenges and issues, inclusiveness; communication and security systems; interaction and integration between building structure, systems, services, management, control and information technology.	10	20
4	Role of Citizens in Smart Cities Needs of the citizens, smart citizens, citizen-centric smart city development approach, inclusiveness, governance and transparency, services and security systems, roles and responsibilities of citizens, civic engagement and citizenship.	08	20
5	Performance Measurement for Smart Cities Global standards and performance benchmarks, practice codes, monitoring and evaluation, case studies on smart cities.	07	10

Suggested Specification table with Marks:

Distribution of Theory Marks					
R	U	A	N	E	C
10%	45%	30%	5%	5%	5%

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

Course Outcome:

After learning the course the students should be able to:

1. Identify planning criteria and parameters affecting smart cities
2. Classify components of smart infrastructure development
3. Illustrate the role of citizens in the development of smart cities
4. Make use of performance evaluation criteria and case studies on smart cities.

List of Reference Books:

1. *Title: Smart Cities, Smart Future: Showcasing Tomorrow Author: Barlow, M. and Levy-Bencheton, C., Publisher: Wiley.*
2. *Title: Handbook of Green Engineering Technologies for Sustainable Smart Cities (Green Engineering and Technology), Author: Saravanan, K. & Sakthianathan, G., Publisher: CRC Press.*
3. *Title: Introduction to Smart Cities, Author: Kumar, Publisher: Pearson*
4. *Title: Smart City in India: Urban Laboratory, Paradigm or Trajectory? Author: Singh, B. & Parmar, M., Publisher: Routledge India.*
5. *Title: Smart Cities and Urban Development in India Author: Mani, N., Publisher: New Century Publications.*

Open e-Resource:

1. https://onlinecourses.nptel.ac.in/noc26_cell/preview

List of Suggested Tutorials:

- (1) Introduction to Smart Cities
- (2) Development of Smart Cities
- (3) Smart Infrastructures
- (4) Role of Citizens in Smart Cities
- (5) Performance Measurement for Smart Cities



GANDHINAGAR INSTITUTE OF TECHNOLOGY
Bachelor of Technology
Civil Engineering Department
6th Semester

Subject Code: 10020614	Subject Title: Railway, Airport & Harbor Engineering
Pre-requisite: Nill	

Course Objective:

- The course covers fundamental knowledge of component parts, their function, design of track and overall operation of Railways.
- The fundamental knowledge of various important elements of Airport Engineering. It includes the planning and design of Airports.
- It will give the clear understanding of the Harbor and its components.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	0	2	4	70	30	30	20	150

Subject Contents				
Sr. No	Topic	Total Hours	Weight (%)	
1	RAILWAY ENGINEERING: General: Development of railways in India, Permanent way and railway track components, different gauges in India, conning of wheels, Functions of various Components - Rails, Sleepers and Ballast, Rails - types of rails, rail sections, defects in rails, creep of rails, rail fixtures and fastenings, rail joints and welding of rails, sleepers – types, spacing and density, Ballast – types, advantages and disadvantages, Subgrade – Requirement, embankment.	8	20	
2	Geometric Design Of Railway Track: gradients, grade compensation, speed of trains on curves, super elevation, cant deficiency, negative super elevation, curves, widening on curves. Track layouts, Layout of Turnout.	3	10	
3	Railway station and Yard: Railway traction and track resistance, stresses in railway track – rails, sleepers, ballast. Points and crossings. Railway stations - requirements, facilities, classifications, platforms, loops, sidings. Railway yards – types, required equipment in yards. Signaling and control system – objectives, classification, Interlocking of signals and points.	7	15	



4	AIRPORT ENGINEERING: General: History, development, policy of air transport, aircraft, aerodromes, air transport authorities, air transport activities, air crafts and its characteristics, airport classifications as per ICAO.	1	5
5	Airport Planning: Regional planning-concepts and advantages, location, and planning of airport as per ICAO and FAA. Airport Master plan, Airport site selection, Zoning laws, Airport Elements -airfield, terminal area, zoning laws, classification of obstructions, approach zone, turning zone, airport capacity, runway capacity, estimation of future air traffic, development of new airport, requirements of an ideal airport layout.	5	10
6	Run Way Design: Wind rose and orientation of runway, wind coverage and crosswind component, factors affecting runway length, basic runway length and corrections to runway length, runway geometrics and runway patterns (configurations), Runway marking. Introduction to Taxiway Design.	5	10
7	Introduction to Terminal Area (Elements and requirements, terminal building functions), Basics of Grading and Drainage: (Airport grading-importance, operations, airport drainage aims, functions, basic requirements)	3	5
8	Introduction to Air Traffic Control and Visual Aids: Need of Air traffic control, Air traffic control network, Air traffic control aids -landing information system, airport markings and lighting.	3	5
9	Introduction to Water Transportation: History, Scope, Merits, Developments of Water Transportation in India, Inland waterways, River, Canal, Inland water transportation, Harbor, Port, Dock, Development of Ports & Harbors, classification, Harbor site selection, Harbor dimensioning.	3	10
10	Harbor Infrastructures: Design of Harbor entrance, channel, turning basin, IS provisions, Breakwaters - function, types, general design principles, wharves, quays, jetties, piers, pier heads, dolphin, fenders, and mooring accessories. Repair facilities, wet docks, lift docks, dry docks, gates for graving docks, floating docks, slipways, locks and gates.	4	10

Suggested Specification table with Marks

Distribution of Theory Marks					
R	U	A	N	E	C
20%	20%	20%	20%	10%	10%

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

Course Outcome:

1. After learning the course the students should be able to:
2. Know about railway track components, their materials, size, function and importance.
3. Carry out geometric design of railway track
4. Recognize about various components in diverging, merging and crossings of railway tracks, stations, yards, signaling, interlocking and control systems, to comprehend the use of Air Traffic Control and Visual Aids in the air traffic operation.
5. To understand planning concepts and functional components of Harbor.



List of Reference Books:

1. *Title: “Railway Engineering”, Author: Satish Chandra and M.M. Agrawal, Publisher: Oxford University Press, New Delhi*
2. *Title: “A Text Book of Railway Engineering”, Author: S.C. Saxena and S. P. Arora, Publisher: Dhanpat Rai & Sons, New Delhi*
3. *Title: “Airport Planning & Design”, Author: Dr. S. K. Khanna, M.G.Arora and S.S. Jain, Publisher: Nem Chand & Bros., Roorkee*
4. *Title: “Airport Engineering”, Author: G.V. Rao, Publisher: Tata McGraw Hill Pub. Co., New Delhi*
5. *Title: Airport Engineering: Planning, Design and Development of 21st Century Airports Author: Norman J. Ashford, Saleh Mumayiz, Paul H. Wright, Publisher: John Wiley & Sons.*
6. *Title: A Course in Docks and Harbour Engineering, Author: S. P. Bindra, Publisher: Dhanpat Rai & Sons, New Delhi.*

Open e-Resource:

1. www.nptel.iitm.ac.in
2. www.indianrail.com
3. <https://www.dgca.gov.in/>
4. <https://nhai.gov.in/>
5. <http://www.aai.aero/>

List of Suggested Assignments/Tutorials:

1. Component parts of Railway track, importance, and their functions
2. Geometric design of railway track
3. Signal control system of Railway
4. Runway and Taxiway design of Airport
5. Terminal area, parking and drainage system at Airfield
6. Air Traffic Control and Visual Aids
7. Harbor site selection and dimensioning
8. Harbor infrastructure



Gandhinagar Institute of Technology (01)
Bachelor of Technology
Civil Engineering Department
5th Semester

Subject Code: 10020513	Subject Title: Sustainable Building Technology
Pre-requisite: Building Construction, Concrete Materials and Technology	

Course Objective:

- To identify concepts of sustainability and rating systems

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	0	2	4	70	30	30	20	150

Subject Contents				
Sr. No	Topic	Total Hours	Weight (%)	
1.	Introduction to Sustainability Concept, need, sustainable development goals, three pillars of sustainability, ethical considerations and equity, meteorological and climatic considerations, site selection and planning.	2	5	
2.	Energy Conservation Embodied energy of materials, energy efficient lighting, building automation, ventilation and air quality requirement, passive cooling and thermal comfort, renewable energy harvesting and usage in buildings, National and international energy conservation policies, Role of government regulations and incentives, Energy labelling and certification programs, Corporate social responsibility and reporting.	10	25	
3.	Building Materials and Technologies Features and characteristics of alternative and natural materials like bamboo, timber, rammed earth, stabilized mud blocks, agro and industrial wastes; Sustainable construction technologies, carbon footprint for building materials and technologies, concept of life cycle assessment.	8	20	
4.	Water Conservation and Wastewater Management Water usage minimization, planning and systems for water conservation, sustainable wastewater treatment techniques, use of rated materials and fixtures. Role of individuals, industries, and governments in water conservation.	8	20	
5.	Solid Waste Management Need, type, objectives and scope, domestic solid waste management, construction and demolition waste utilization, recycling and resource recovery, waste management regulations and policies.	6	15	
6.	Green Building Rating Systems Environmental issues and challenges, Benefits, Principles and criteria of green building assessment, Leadership in	6	15	



Energy and Environment Design (LEED), Indian Green Building Council (IGBC), Green Rating for Integrated Habitat Assessment (GRIHA), importance of certification.		
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Suggested Specification table with Marks

Distribution of Theory Marks					
R	U	A	N	E	C
20%	25%	25%	25%	0	5%

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

Course Outcome:

After learning the course the students should be able to:

1. Apply effective energy conservation systems
2. Examine sustainable building materials and technologies
3. Develop strategies for water conservation and waste management.

List of Reference Books:

- Jagadish, K. S., *Sustainable Building Technologies*, IK International Publishing House.
- Jagadish, K. S., Venkatarama Reddy, B. V. and Nanjunda Rao, K. S., *Alternative building Materials and Technologies*, New Age International.
- Rai, G. D., *Non-conventional energy resources*, Khanna Publishers.
- Bhatia, S. C., *Wealth from Waste, Volume I-II*, Atlantic Publication.
- Pandel, U. & Poonia, M. P., *Environmental Technologies for Sustainable Development*, Prime Publishing.
- Wright, R. T., & Boorse, D. F., *Environmental Science towards a sustainable development*, Pearson.

Open Resources:

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

List of Suggested Tutorials:

1. Energy Conservation
2. Building Materials and Technologies
3. Water Conservation and Wastewater Management
4. Solid Waste Management
5. Green Building Rating Systems



Gandhinagar Institute of Technology (01)
Bachelor of Technology
Civil Engineering Department
6th Semester

Subject Code: 10020603	Subject Title: Traffic Engineering
Pre-requisite: Basic knowledge of Transportation Engineering	

Course Objective:

- To set a compact foundation in the field of traffic engineering
- To enable the students to apply the basic principles of traffic engineering in the design of traffic facilities based on traffic flow theory.
- To equip the students for traffic system management in the urban area.
- To enable the students for estimating capacity and level of service for the rural and urban area.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	0	2	4	70	30	30	20	150

Subject Contents				
Sr. No	Topic	Total Hours	Weight (%)	
1.	Introduction: Traffic engineering administration and functions, Organization of the traffic engineering department, Road user and vehicular characteristics.	3	05	
2.	Basic traffic flow parameter and Traffic Surveys: Definition – Flow, Volume, Speed, Space headway, Time headway, Density. Relationship between Flow, Speed and Density, Traffic Surveys: Speed, Journey time and Delay surveys, Classified volume count survey, Vehicle occupancy survey, Origin – Destination survey, Parking Survey, Use of photographic techniques in traffic survey, Introduction about Lighthill and Witham's Theory.	10	20	
3.	Traffic Forecasting: Need for traffic forecasting, Types of traffic, Forecasts based on past trends and extrapolation, period for forecasting.	5	15	
4.	Parking studies: Traffic and parking problems, Ill effects of parking, Zoning and parking space requirement standards, Design standards for on street parking, Off street parking facilities.	3	10	
5.	Design of Intersection: Design of at grade & grade separated intersection – rotary intersection – capacity of rotary intersection – Traffic signals,	10	20	



	Advantages and disadvantages, Types of signals, Methods of setting signal timings, Warrants for signals, Coordinated control of signals, Necessity of signal coordination, Types of coordinated signal system		
6.	Traffic Accidents – Causes and prevention: Accident situation in India, Collection of accident data, Statistical methods for analysis of accident data, Road and it's effect on accidents, Skidding, Speed in relation of safety, Condition and collision diagram and its utility, Legislation, Enforcement, Education and Propaganda.	5	15
7.	Highway Capacity: Importance of 'Capacity' in Highway transportation studies, Capacity of uninterrupted flow conditions as per Indo-HCM, PCU in reference to Indo-HCM in urban and rural area, Determination of Level of service, Factors affecting capacity and level of service.	6	15

Suggested Specification table with Marks

Distribution of Theory Marks					
R	U	A	N	E	C
10%	20%	20%	20%	10%	20%

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

Course Outcome:

After learning the course the students should be able to:

1. Determine the traffic flow parameters for traffic management
2. Predict the future traffic demand for the urban and rural area
3. Plan the parking plots as per the traffic availability in the urban area
4. Design the various types of intersection in the urban area.
5. Propose the different types of traffic system management technique and Evaluate the capacity and level of service on the streets of rural and urban area.

List of Reference Books:

1. *Title:* Traffic Engineering and Transport Planning, *Author:* L R Kadiyali, *Publisher:* Khanna Publishers, New Delhi, 2002.
2. *Title:* Transportation Engineering-An Introduction, *Author:* C J Khistyand, *Publisher:* L B Kent, Prentice-Hall, New Jersey, 2005.
3. *Title:* Traffic Flow Fundamentals, *Author:* A D May, *Publisher:* Prentice – Hall, Inc., New Jersey, 1990.

IRC Codes:

1. IRC-SP -12 2015 Parking facilities in Urban Roads 11.
2. IRC SP - 41 Guidelines for the Design of At-Grade Intersection
3. IRC 35 - 2015 Code of Practice for Road Markings – Second Revision
4. IRC 67 - 2001 Road Signs
5. IRC 108 - 2015 Guidelines for traffic forecast on Highways
6. IRC 119 - 2015 Guidelines for traffic safety Barriers.
7. IRC 65 - 1976 Traffic Rotaries



8. IRC 93 - 1985 Design & Installation of Road Traffic Signals

Open e-Resource:

1. <https://www.irc.nic.in/>
2. <https://crridom.gov.in/node/1>
3. www.nptel.iitm.ac.in
4. <https://nhai.gov.in/>

List of Traffic Survey:

1. Spot speed survey
2. Moving car method of survey for journey time
3. Delay studies survey
4. Classified volume count survey
5. Vehicle occupancy survey
6. Origin – Destination survey
7. Parking survey

Gandhinagar Institute of Technology (01)
Bachelor of Technology
Civil Engineering Department
6th Semester

Subject Code: 10020608	Subject Title: Foundation Engineering
Pre-requisite: 1. Geotechniques & Applied Geology (GTAG) 2. Strength of Materials and Soil Mechanics	

Course Objective:

1. Foundation Engineering is very fundamental subject consisting of selection of proper type of foundation as per sub-soil profile and type of structure. Any civil engineering structure needs strong and stable foundation which depends on proper understanding of soil behaviour, determination and interpretation of soil parameters, determination of stresses in soil.
2. The design of any foundation system is based on understanding of soil parameters and its implication based on through interaction with type of structure.
3. The course on Foundation Engineering provides the students basic knowledge on foundation selection, foundation forces, foundation design and its stability under seismic forces.
4. Various types of foundation and their analytical solution helps the student to design suitable foundation with respect to soil and site condition.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	University Assessment	University Assessment	University Assessment	
3	0	2	4	70	30	30	20	150

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Selection of foundation and Sub-soil exploration/investigation: Types of foundation, Factors affecting the selection of type of foundations, steps in choosing types of foundation based on soil condition, Objectives and planning of exploration program, methods of exploration-wash boring and	06	18

	rotary drilling-depth of boring, soil samples and soil samplers-representative and undisturbed sampling, field penetration tests: SPT, SCPT, DCPT. Introduction to geophysical methods, Bore log and report writing, data interpretation.		
2	Shallow Foundation: Introduction, significant depth, design criteria, modes of shear failures. Detail study of bearing capacity theories (Prandtl, Rankine, Terzaghi, Skempton), bearing capacity determination using IS Code, Presumptive bearing capacity. Settlement, components of settlement & its estimation, permissible settlement, Proportioning of footing for equal settlement, allowable bearing pressure. Bearing capacity from in-situ tests(SPT, SCPT, PLATE LOAD), Factors affecting bearing capacity including Water Table., Bearing capacity of raft/mat foundation as per codal provisions, Contact pressure under rigid and flexible footings. Floating foundation. Types of pavements & its design.	10	25
3	Pile foundations: Introduction, load transfer mechanism, types of piles and their function, factors influencing selection of pile, their method of installation and their load carrying characteristics for cohesive and granular soils, piles subjected to vertical loads-pile load carrying capacity from static formula,dynamic formulae (ENR and Hiley), penetration test data & Pile load test (IS 2911). Pile group: carrying capacity, efficiency and settlement. Negative skin friction.	07	22
4	Foundations on problematic soil & Introduction to Geosynthetics: Significant characteristics of expansive soil, footing on such soils, Problems and preventive measures. Under-reamed pile foundation-its concept,design & field installation. Significant characteristics of silt and loess, problems & remedial measures footing on such soils, introduction to geosynthetics-types and uses.	05	18
5	Retaining walls: Types (types of flexible and rigid earth retention systems: counter fort, gravity, diaphragm walls, sheet pile walls, soldier piles and lagging).	07	17

Suggested Specification table with Marks

Distribution of Theory Marks					
R	U	A	N	E	C
10%	10%	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)

Course Outcome:

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

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.
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.
3. Design deep foundation satisfying bearing capacity and settlement requirements.
4. Design and analysis of retaining walls and sheet piles under static loads.
5. Understand the engineering behaviour of expansive soils and selection of suitable foundation type for such soils. Selection of alternate materials like geosynthetics and its application in foundation problems.
- 6.

List of Reference Books:

1. Title: Soil Mechanics & Foundation Engineering Author: Murthy V. N. S. Publisher: Dhanpat Rai, Engineering.
2. Title: Soil Mechanics & Foundation Engineering Author: Alamsingh Publisher: CBS Publishers & Distributors, Delhi.
3. Title: Basic & Applied Soil Mechanics Author: Gopal Ranjan & Rao A. S. R. Publisher: New Age International Publishers.
4. Title: Principles of Geotechnical Engineering Author: Das Braja M Publisher: Thomson Asia Pvt. Ltd
5. Title: Soil Mechanics and Foundation Engineering Author: P. Purushothama Raj Publisher: Pearson Education.
6. Title: Soil Mechanics & Foundation Engineering Author: Arora K. R. Publisher: Standard Publications.
7. Title: Soil Mechanics & Foundations Author: Punmia B. C. Publisher: Laxmi Publications.

Open e-Resource:

1. https://onlinecourses.nptel.ac.in/noc22_ce96/preview
2. <https://archive.nptel.ac.in/courses/105/101/105101201/>
3. <http://www.nptel.iitm.ac.in/courses/>

List of Suggested Experiments:

1. Plate load test (PLT)
2. Standard Penetration test (SPT)
3. Static and Dynamic Cone Penetration test (SCPT-DCPT)
4. Triaxial Shear Test (CD condition)
5. Consolidation test (on soft marine clays)
6. Swell Pressure test
7. CBR test



Gandhinagar Institute of Technology (01)
Bachelor of Technology
Civil Engineering Department
6th Semester

Subject Code: 10020611	Subject Title: Engineering Hydrology and Water Resources
Pre-requisite: Basic Knowledge of hydrological cycle and its component and ground water hydrology	

Course Objective:

- To prepare the students for a successful career as hydrologist and water resources engineers
- To develop the ability among students to synthesis data and technical concepts for application in hydrology and water resources engineering

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	0	2	4	70	30	30	20	150

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	MODULE – I Hydrological Parameters: Hydrological cycle, Water balance concept, Climate and availability of water, types and forms of precipitation, Variability in rainfall, Measurement & Data analysis of precipitation, Evaporation and its measurement, Transpiration and its measurement, Measurement of Evapotranspiration, Potential and actual evapotranspiration, Penman Monteith method. Infiltration indices, Factors affecting infiltration, Horton's equation and Green Ampt method.	10	20
2	MODULE – II Runoff: Drainage basin and watershed characteristics, Types of runoff, Surface, subsurface flow, base flow. Hydrographic Analysis: Mass curve, Hyetograph, Hydrograph with types, assumptions, rationale and limitations of unit hydrograph, Derivation of unit hydrograph and its conversions, S- hydrograph and its uses, Snyder's Hydrograph, Flow duration curve and its uses.	10	20



3	MODULE – III Groundwater Hydrology: Occurrence, Darcy's law, well hydraulics, well losses, Yield, Pumping and recuperation test. Dams and Reservoirs: Types, Investigations, Site selection, Zones and levels of storage in reservoir, Safe and Design yield, Reservoir capacity, Reservoir sedimentation and control, Bed load, suspended load. Types of dams, Selection of type and site of dam, Information about major dams and reservoirs of India.	14	30
4	MODULE – IV Drought Management and Water Harvesting: Definition of drought, Causes and types of droughts, measures for water conservation and augmentation, drought contingency planning and execution. Water harvesting: rainwater collection, small dams, runoff enhancement, runoff collection, ponds, tanks, rooftop model of rainwater harvesting.	4	15
5	MODULE – V Water Resources Planning and Management: Requirement of Water Resources schemes, Principles and objectives of Water Resources planning. Levels in planning, Functional requirements of water resources projects, steps in water resources planning, Environmental aspects in water resources planning.	4	15

Suggested Specification table with Marks

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

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

Course Outcome:

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

1. Understand hydrological parameters and methods for measurement and analysis of precipitation, evapotranspiration, and infiltration.
2. Understand runoff processes and apply hydrographic analysis methods for estimation and management of watershed runoff.
3. Understand groundwater flow, well hydraulics, and reservoir and dam planning for sustainable water resources development and management.
4. Understand drought management and apply water harvesting techniques for water conservation and augmentation.
5. Understanding the concepts of Water resources planning and its environmental aspects.



List of Reference Books:

1. *Title:* K. Subramanya, Engineering Hydrology, *Author:* Tata McGraw Hill, *Publisher:* Pub. Co. New Delhi.
2. *Title:* Engineering Hydrology, *Author:* C.S.P. Ojha, R. Berndtsson and P. Bhunya, *Publisher:* Oxford University Press, New Delhi.
3. *Title:* Hydrology and Water Resources Engineering, *Author:* R.K. Sharma and T.K. Sharma, *Publisher:* Dhanpat Rai Publications, New Delhi
4. *Title:* Water Resources Engineering, *Author:* R.K. Linsley, J.B. Franzini, D.L. Freyberg and G. Tchobanoglous, *Publisher:* McGraw Hill Singapore.
5. *Title:* Applied Hydrology, *Author:* Ven Te Chow, D.R. Maidment and L.W. Mays, *Publisher:* McGraw Hill International Edition, New York

Open e-Resource:

1. nptel.ac.in/downloads/105105110

List of Suggested Experiments:

1. To determine rate of infiltration and infiltration capacity using double ring infiltrometer.
2. Measurement of rainfall
3. Estimation of flood using unit hydrograph
4. Computation of rate of infiltration using infiltrometer
5. Computation of live and dead storage capacity of reservoir
6. Flood routing of reservoir and channel
7. Calculation of dependable flow.
8. Determination of capacity of well.
9. Calculation of power of a hydro-power plant

List of Suggested Tutorials:

1. Introduction
2. Hyetograph & Hydrograph Analysis
3. Groundwater
4. Introduction to Dams
5. Introduction to Reservoir
6. Drought Management & Water Harvesting
7. Water Resources Planning and Management



GANDHINAGAR INSTITUTE OF TECHNOLOGY
Bachelor of Technology - Civil Engineering
Semester: VI

Subject Code: 10020610	Subject Title: Structural Design-I
Pre-requisite: Mechanics of Solids, Theory of Structure-I & II, Concrete Technology	

Course Objective:

1. This subject is applications of structural engineering principles to design basic structural elements using reinforced concrete and steel concrete as materials.
2. This subject is specifically aimed to develop understanding of various design philosophy, Indian codal provisions, design basis used in design of basic elements of framed structures and its detailing requirement.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	0	2	4	70	30	30	20	150

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Introduction: Objectives, Properties of Reinforced Concrete and Structural Steel, Loads & load combinations, Methods of Analysis, Codes & specifications, Design Philosophies - Working stress Method, Ultimate Load Method, Limit State Method, Plastic Method.	2	5
2	Limit state design for RC structures: 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.	8	20



	Limit state of Axial, Shear and Torsion, Bond & Anchorage, Development length		
3	Limit state design of RC structural Element: Design of Beams: Simply supported, cantilever and continuous beams. Design of Slab: One way, two way simply supported and continuous slabs Design of Column: Classifications, Assumptions, Design of Short Columns under axial load Design of Foundations: Design of isolated footing under axial load and uni-axial bending, combined footing.	10	25
4	Philosophy of Limit state design for Steel: Limit state of collapse & serviceability, partial safety factor for material and loading, Type & behavior of sections – Plastic, compact, semi compact, slender. Connections: Bolted connections – bearing type, behavior of bolted joints, Design strength of ordinary & HSFG bolts. Welded connections- Fillet and Butt weld, design of simple connections such as lap and butt joints, truss joint connections.	10	25
5	Limit state design of Steel components: Axial force design: Tension member: types of tension member, behavior, modes of failure, Design of tension member, splices, lug angle. Compression member: Behaviour, classification of sections, possible modes of failure, elastic buckling of slender member, design of compression member having single & built-up section, lacing & battening. Design for Beams and Beam-Columns: Type of sections, classification, Lateral stability, Design strength of laterally restrained and unrestrained beams, shear strength, deflection, web buckling & crippling.	10	25

Course Outcome:

- CO-1** Describe different properties of RC and Structural steel, loads & its combinations, method of analysis used in design of structural elements.
- CO-2** Explain different design philosophy evolved time to time and its applicability in designing structural elements.
- CO-3** Apply Indian standard codal provisions of Limit state methods for RC and Steel structural components.
- CO-4** Apply design principles of Limit state methods in RC and steel structural components.
- CO-5** Appraise capacity of RC and Steel structural elements in different design methods and designing section with appropriate method.



List of Text Books:

1. Title: Reinforced concrete Vol-I Author: Dr. H.J. Shah Publisher: Charotar Pub. Anand
2. Title: Design of Concrete Structures Author: A.K.Jain Publisher: Nemchand Publication
3. Title: Steel Structures Author: N.Subramanian Publisher: Oxford Publication
4. Title: Design of Steel Structures Author: Ramamrutham S. & Narayanan R Publisher: Dhanpatrai & Sons, Delhi
5. IS: 456 - Code of practice for plain and reinforced concrete
6. IS: 800 – 2007, Code of practice for General Construction in steel

List of Reference Books:

1. Title: Limit State Theory & Design of Reinforced Concrete Author: Shah & Karve Publisher: Structure Pub., Pune
2. Title: Limit State Design of Concrete structure Author: P. C. Vargheese Publisher: Prentice Hall India Learning Private Limited
3. Title: Design of Steel Structures Author: Arya & Ajamani Publisher: Nemchand & Bros., Roorkee
4. Title: Design of Steel Structures Author: Dayaratnam Publisher: Wheelor pub. co., Delhi
5. IS: 875 (Part I to V) - Code of practice for structural safety of Buildings Loading standards
6. SP: 6(1) - Structural steel section SP: 6(6) - Application of plastic theory in design of steel structures

Open e-Resource:

1. <http://www.nptel.iitm.ac.in/courses/>

List of Suggested Tutorials:

1. The students will have to solve at least five examples and related theory from each topic as an assignment/tutorial.
2. Prepare sketches of structural detailing of RC and steel components in sketch book/A3 size sheet.



Gandhinagar Institute of Technology (01)
Bachelor of Technology
Civil Engineering Department
5th Semester

Subject Code: 10020511	Subject Title: Advanced Fluid Mechanics
Pre-requisite: Fluid Mechanics	

Course Objective:

- To familiarize the students with fluid mechanics and its applications to model real-life engineering problems.
- To Apply the basic applied mathematical tools that support fluid mechanics.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	0	2	4	70	30	30	20	150

Subject Contents				
Sr. No	Topic	Total Hours	Weight (%)	
1	Governing Equations: a) Review of Fluid Mechanics: - Definition and properties of Fluids, Fluid as continuum, Continuum model, Flow kinematics: - Lagrangian and Eulerian description, Substantial or Total derivatives, Basic flow-analysis techniques, Flow Patterns: Streamlines, Streak lines, and Path lines b) Integral Relations for a Control Volume: Reynolds transport theorem, Conservation of mass, Linear momentum equation, Energy equation, Frictionless flow, Bernoulli equation c) Differential Relations for a Fluid Particle: Acceleration field of a fluid, Differential equation of mass conservation, Differential Equation of linear momentum, Differential equation of Energy, Boundary Conditions for the basic equations, Velocity Potential, Stream Function, Vorticity.	10	25	
2	Navier-Stokes Equations a) Generalized form of NSE, Special forms: Euler equations, Bernoulli equation, b) Exact solutions of Navier Stokes equations: fully developed flow in channel, pipe, flow between concentric rotating cylinders, Couette flow, Hagen-Poiseuille flow; flow over a flat plate, cylinders	10	25	



	and spherical bodies; Stokes First problem (unsteady flow), Creeping flow past a sphere, cylinder.		
3	Boundary layer theory: Boundary layer theory for laminar and turbulent flow, Blasius solution for flat plate, approximate methods, boundary layer separation and control, Effect of roughness. Effect of pressure gradient, Separation, Secondary flow	8	20
4	Turbulent flow Introduction to Turbulent Flow, characteristics of turbulence, laminar-turbulent transition, Correlation functions, Mean and fluctuations, Governing equations, turbulent boundary layer for internal and external flows, Boundary conditions, shear stress models, Prandtl's mixing length, Velocity profile over a flat plate and in pipes, Taylor's theory of turbulence dispersion	8	15
5	Compressible flow: Review of one-dimensional compressible flow, speed of sound, variable cross-section flow, converging-diverging nozzle, Fanno and Rayleigh curve, normal shock relation, past slender bodies, compressible boundary layer, Prandtl Mayor's Equation.	6	15

Suggested Specification table with Marks

Distribution of Theory Marks					
R	U	A	N	E	C
15%	10%	15%	15%	10%	5%

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

Course Outcome:

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

1. Ascertain basic concepts of fluid mechanics and apply the concepts in the analysis of fluid flow problems
2. Explain the governing equations of fluid flow to obtain the exact solutions to N-S equation
3. Interpret & apply boundary layer theory for various fluid flow problems.
4. Analyze & solve the equations of turbulent flow and its models.
5. Describe the concept of compressibility of fluid flow & governing equations.

List of Reference Books:

1. *Title:* A Textbook of Fluid mechanics & Hydraulic Machines, *Author:* Bansal, R. K., *Publisher:* Laxmi Publications.
2. *Title:* Fluid Mechanics, *Author:* A.K. Jain, *Publisher:* 4th edition, Khanna Publishers.
3. *Title:* Hydraulics and Fluid Mechanics, *Author:* P.N. Modi and S.M. Seth, *Publisher:* Standard Book House, New Delhi.
4. *Title:* Engineering Fluid mechanics, *Author:* K.L. Kumar, *Publisher:* 8th Edition S. Chand & Company Ltd.
5. *Title:* Theory and Applications of Fluid Mechanics, *Author:* K. Subramanya, *Publisher:* Tata McGraw Hill.
6. *Title:* Fluid Mechanics, *Author:* Frank M White, *Publisher:* McGraw Hill Publication.
7. *Title:* Modern Compressible Flow –with Historical Perspective, *Author:* Anderson, J. D. Jr., TMH, 2020, 4th edition.



8. *Title:* Boundary Layer Theory, *Author:* Schlichting, H and Gersten, K, 9th Edition, Springer, 2018.

Open e-Resource:

1. <https://nptel.ac.in/courses/112105218>

List of Suggested Experiments:

Students will have to perform following experiments in laboratory and prepare the laboratory manual. The students will have to solve five problems covering all modules.

1. Viscous flow through parallel plates
2. Pipe friction
3. Pressure distribution around objects
4. Uniform flow in Open Channel
5. Application of specific energy and momentum principle (Hydraulic jump)
6. Performance characteristics of Centrifugal pump
7. Performance Characteristics of Water Turbines
8. Similitude and Model Studies
9. Development of Computer programs for fluid flow in pipes, open channels, hydraulic machines and dimensional analysis.



Gandhinagar Institute of Technology (01)
B.Tech in Engineering
Civil Engineering Department
5th Semester

Subject Code: 10020512	Subject Title: Advanced Concrete Technology
Pre-requisite: Basics of construction building materials and concrete technology	

Course Objective:

- To develop advanced understanding of concrete behavior, microstructure, durability mechanisms, and performance-based design concepts beyond conventional concrete technology.
- To enable students to design, evaluate, and apply advanced concretes, supplementary cementitious materials, repair systems, and modern concreting techniques for sustainable and durable infrastructure.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	0	2	4	70	30	30	20	150

Subject Contents				
Sr. No	Topic	Total Hours	Weight (%)	
1.	Advanced Cementitious Systems & Microstructure: Microstructure of hydrated cement paste; C-S-H structure; ITZ (Interfacial Transition Zone); Hydration kinetics; Pore structure and permeability; Rheology of fresh concrete; Performance-based concrete concepts; Durability-based design philosophy.	8	20	
2.	Supplementary Cementitious Materials (SCMs): Fly ash, GGBS, silica fume, metakaolin, rice husk ash – physical, chemical and mineralogical properties; Pozzolanic reaction; Effect on fresh and hardened properties; High volume fly ash concrete; Codal provisions (IS 456, IS 10262, ASTM overview); Sustainability and embodied carbon reduction.	10	20	
3.	High Performance & Special Concretes: High strength concrete (HSC); High performance concrete (HPC); Self-compacting concrete (SCC); Fiber reinforced concrete (FRC); Engineered Cementitious Composites (ECC); Geopolymer concrete; Pervious concrete; Lightweight and heavyweight concrete; Mix proportioning principles for advanced concretes.	12	30	
4.	Durability, Service Life & Performance Evaluation: Advanced durability concepts; Chloride ingress and corrosion modeling; Carbonation depth prediction; Sulphate attack; Alkali-aggregate reaction; Shrinkage and creep prediction models; Non-destructive testing (Rebound	8	15	



	hammer, UPV); Rapid chloride permeability test; Service life estimation methods.		
5.	Repair, Rehabilitation & Modern Concreting Techniques: Repair materials: micro-concrete, polymers, epoxies, grouts, FRP systems; Concrete overlays; Waterproofing systems; Case studies; Mass concreting; Roller compacted concrete; Ready-mix concrete; Pumped concrete; Underwater concreting; Hot and cold weather concreting; 3D printed concrete (overview).	7	15

Suggested Specification table with Marks

Distribution of Theory Marks					
R	U	A	N	E	C
10%	15%	30%	25%	10%	10%

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

Course Outcome:

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

1. Analyze microstructural behavior and durability mechanisms of concrete.
2. Evaluate and proportion advanced concrete mixes incorporating SCMs.
3. Select appropriate special concrete for specific structural and environmental conditions.
4. Recommend suitable repair materials and modern concreting techniques for field applications.

List of Reference Books:

1. *Title:* Concrete: Microstructure, Properties and Materials *Author:* P. Kumar Mehta & Paulo J.M. Monteiro *Publisher:* McGraw Hill Education
2. *Title:* Properties of Concrete *Author:* A.M. Neville *Publisher:* Pearson Education
3. *Title:* Concrete Technology: Theory and Practice *Author:* M.S. Shetty & A.K. Jain *Publisher:* S. Chand & Company Ltd.
4. *Title:* Advanced Concrete Technology (Vol. 1–4) *Author:* John Newman & Ban Seng Choo *Publisher:* Butterworth-Heinemann (Elsevier)
5. *Title:* High Performance Concrete *Author:* Pierre-Claude Aïtcin *Publisher:* CRC Press
6. *Title:* Durability of Concrete Structures *Author:* G. Somerville *Publisher:* CRC Press
7. *Title:* Lea's Chemistry of Cement and Concrete *Author:* Peter C. Hewlett & Martin Liska *Publisher:* Butterworth-Heinemann
8. *Title:* Concrete Repair and Maintenance Illustrated *Author:* Peter H. Emmons *Publisher:* R.S. Means Company
9. *Title:* Significance of Tests and Properties of Concrete and Concrete-Making Materials *Author:* ASTM Committee C09 *Publisher:* ASTM International



10. *Title:* Supplementary Cementing Materials in Concrete *Author:* V.M. Malhotra & P.K. Mehta
Publisher: CRC Press
11. *Title:* Fiber-Reinforced Cement Composites *Author:* A. Bentur & S. Mindess *Publisher:* CRC Press
12. *Title:* Self-Compacting Concrete: Theory and Practice *Author:* Peter Domone & John Illston
Publisher: CRC Press
13. *Title:* Eco-Efficient Concrete *Author:* F. Pacheco-Torgal, S. Jalali & J. Labrincha *Publisher:* Woodhead Publishing
14. *Title:* Concrete Durability *Author:* Thomas Dyer *Publisher:* CRC Press
15. *Title:* Engineered Cementitious Composites (ECC): Bendable Concrete for Sustainable and Resilient Infrastructure *Author:* Victor C. Li *Publisher:* Springer

Reference Codes

- IS 456: Plain and Reinforced Concrete
- IS 10262: Concrete Mix Proportioning
- IS 383: Coarse and Fine Aggregates
- ASTM C1202 (RCPT)

Open e-Resource:

1. <https://nptel.ac.in/courses/105102012>
2. <https://nptel.ac.in/courses/105106176>
3. <https://nptel.ac.in/courses/105104206>
4. <https://nptel.ac.in/courses/105105213>
5. <https://nptel.ac.in/courses/105106200>
6. <https://nptel.ac.in/courses/105106202>
7. <https://nptel.ac.in/courses/105106053>

List of Suggested Experiments:

- Flow test / Slump flow test for SCC
- Rapid Chloride Permeability Test (RCPT)
- Compressive strength of High Strength Concrete
- Flexural strength of Fiber Reinforced Concrete
- Mix design using Fly Ash / GGBS
- UPV test on concrete
- Rebound hammer test
- Water absorption & sorptivity test
- Preparation and testing of geopolymer concrete (demonstration)
- Study of repair materials (demonstration / case-based experiment)

Gandhinagar Institute of Technology (01)
Bachelor of Technology
Civil Engineering Department
6th Semester

Subject Code: 10020613	Subject Title: Air and Noise Pollution
Pre-requisite: Environmental Studies	

Course Objective:

1. Ability to describe the effects of air pollution and noise pollution; discuss the method to solve the problems.
2. This course provides a comprehensive overview of air and noise quality, and the science and technology associated with monitoring and control.
3. Ability to explain the principle of equipment for particulate, air pollution treatment, ventilation system and reduce noise pollution in the industry.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	0	2	4	70	30	30	20	150

Subject Contents				
Sr. No	Topic	Total Hours	Weight (%)	
1	Air Pollution concept and sources, atmospheric stability, air pollutants classification, pollutant dispersion, health effects on humans and environment.	07	15	
2	Air Quality Monitoring need, air quality standards, air quality index, sampling & analysis of stack gases and ambient air, dispersion models for air pollutants, plume behavior, stack height design.	11	25	
3	Air Pollution Control Preventive measures and techniques, equipment for controlling particulate matter, control methods for gaseous pollutants, laws and regulations.	12	25	
4	Noise Pollution and Control introduction, sources, classification, effects on human health, physics of noise, vibrations, indoor and outdoor sound measurement methods, permissible limits, control, noise reduction techniques, case studies.	15	35	

Suggested Specification table with Marks:

Distribution of Theory Marks					
R	U	A	N	E	C
45%	30%	10%	10%	5%	0

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

Course Outcome:

After learning the course the students should be able to:

1. Appraise air pollutants and quality monitoring techniques
2. Examine suitable air pollution control methods
3. Identify the effects of noise pollution and select appropriate control method
4. Analyse air quality index for pathways of climate change

List of Reference Books:

1. *Title: Environmental Pollution Control Engineering Author: C. S. Rao, Publisher: Wiley Eastern Limited, 2000.*
2. *Title: Air pollution Author: M. N. Rao, H. V. N. Rao Publisher: Tata McGraw Hill Pvt. Ltd, New Delhi, 1993.*
3. *Title: Noise Pollution Author: G.K. Nagi, M.K. Dhillon, G.S. Dhaliwal, Publisher: Commonwealth Publishers*
4. *Title: Sewage Disposal and Air Pollution Engineering Author: S.K. Garg, Publisher: Khanna publishers,*
5. *Title: Environmental pollution analysis Author: S.M. Khopkar, Publisher: New Age International Publications*

Open e-Resource:

1. <https://nptel.ac.in/courses/105107213>

List of Suggested Tutorials:

1. Air Pollution
2. Air Quality Monitoring
3. Air Pollution Control
4. Noise Pollution and Control



Gandhinagar Institute of Technology (01)
Bachelor of Technology Civil Engineering Department
Semester-VII

Subject Code: 10020701	Subject Title: Design of Structures II
Pre-requisite: Mechanics of Solids, Structural Analysis, Concrete technology, Design of Structure-I	

Course Objective:

- Prepare and design of RCC and Steel structure works.
- Illustrate factors affecting wind and earthquake on structures.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
4	0	2	5	70	30	30	20	150

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1.	RCC Design: Building Layout and Design: Loads as per I.S., distribution & flow of loads, lateral load due to wind and seismic as per latest IS standards, load combinations, guide lines for preparation of structural layout for building. Analysis, design & detailing of G + 3 RC framed building for residential /commercial purpose including ductile detailing.	8	15
2.	Design of Retaining wall: Types, behavior and application of retaining wall, stability criteria, design & detailing of cantilever & counterfort type retaining wall for various ground conditions.	6	10
3.	Earthquake Resistant Design of building: Earthquake resistant design philosophy, capacity design concept, four virtues of Earthquake Resistant design: strength, stiffness, ductility and configuration, Irregularities in structures, Lateral load distribution – Torsionally coupled & uncoupled	8	15



	system, Seismic coefficient Method, Ductile detailing as per IS:13920.		
4.	Design of Flat Slab: Direct design method – Distribution of moments in column strips and middle strip-moment and shear transfer from slabs to columns – Shear in Flat slabs-Check for one way and two way shears, Limitations of Direct design method, Introduction to Equivalent frame method.	6	10
5.	Design of foot-over bridges: Structural system of through & deck type bridges, design of foot-over bridge & its Supporting system.	8	15
6.	Design of plate girders: Modes of failure : Elastic buckling, Bending in the plane of web, Local buckling, Buckling in the plane of web, Vertical buckling of the compression flange, Shear buckling Design of bolted, welded plate girder by Tension field Method & Simple Post Critical Method including design of vertical & horizontal stiffeners, Splices, Curtailment	8	15
7.	Design of Industrial Building: Structural layout of industrial building, Various types of trusses and their selection, effect of wind loads on purlin and trusses, bracing systems, columns, foundations, gantry girder – static and moving loads, selection & design of section.	12	20

Suggested Specification table with Marks

Distribution of Theory Marks					
R	U	A	N	E	C
10%	20%	25%	25%	15%	5%

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

Course Outcome:

The practical exercises, the underpinning knowledge and the relevant soft skills associated with this competency are to be developed in the student to display the following COs:

1. Assess loads, prepare layout, analyse, design and detail of various structural elements for RC framed structure up to G+3.
2. Apply the principles, procedures and current Indian code requirements to the analysis and design.
3. Apply the principles, procedures and current Indian code requirements to the analysis and design.
4. Determine the loads acting on it and identify the typical failure modes.

List of Text Books:

1. H. J. Shah, Reinforced Concrete, Vol. I and II, Charotar Publishing.
2. N. Subramaniam, Design of Steel Structures, Oxford University Press

**List of Reference Books:**

1. P. Dayaratnam, "Design of Steel Structures", S. Chand Group.
2. IS 800:2007, General Construction In Steel - Code of Practice, Bureau of Indian Standards, New Delhi.
3. IS Codes (latest) : IS:456, IS:875 (all parts), IS:1893(P-1,2), IS:4326, IS:13920, IS: 3370 (P-1 to 4), SP:16, SP:34.
4. S. Unnikrishna Pillai and Devdas Menon, Reinforced Concrete Design, Tata McGraw Hill.
5. S. R. Karve and V. L. Shah, Illustrated Design of Reinforced Concrete Buildings, Structures Publishers.
6. IS 875 (Part 3): latest version, Indian Standard Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures Part 3 Wind Loads, Bureau of Indian Standards, New Delhi.
7. N. Subramaniam, Design of Steel Structures, Oxford University Press

Open e-Resource:

1. www.ensoftindia.com
2. www.newtonindia.com
3. www.estimator.com
4. nptel.ac.in

List of Suggested Experiments:

1. Development of spread sheets for design of various structural elements like beam, column, slab, foundation etc.
2. Design of any one RCC structure or Steel Structure from the course using any open-source / professional software and/or self-developed spread sheet/programs.
3. Failure study : during and/or after construction.
4. Overview of software E tabs, Staad Pro etc.



Gandhinagar Institute of Technology (01)
Bachelor of Technology Civil Engineering Department
Semester-VII

Subject Code: 10020702	Subject Title: Estimating, Costing and Valuation
Pre-requisite: Civil Engineering Drawing, Construction and Construction Equipments	

Course Objective:

- Prepare the quantities, cost estimate and rate analysis of civil engineering works.
- Illustrate factors affecting valuation of property.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	0	2	4	70	30	30	20	150

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1.	Basics of Estimating and Costing: Definition, purpose and related terminologies like provisional sum, prime cost, spots item, day work, administrative approval and technical sanction of civil works, etc. Types of estimates -Approximate estimate and detailed estimate. Roles and responsibility of Estimator. Modes of measurement, measurement units, Rules for deduction in Masonry work, Plastering and Pointing and Painting work of different items of work as per IS code.	4	10
2.	Specifications of civil engineering works: Definition, Objectives and importance of specification, Types of specification, Care to be taken while drafting specifications, Drafting general specifications, and detailed specifications for various civil work items- Specification of materials, specification of works, specification as per building classification, Language of specific writing.	6	10



	Market Survey: Traditional and modular materials, Market survey of materials of Construction, Wages of labour, Tools plant and equipment of construction.		
3.	Detailed Estimate of civil engineering works: Methods of detailed estimation: Individual wall method (Long wall-short wall), centre-line method. Detailed estimation of residential, commercial and industrial buildings, RCC Column, beams, slab, lintel with weather shade, RCC retaining wall and culvert, Estimate of earthwork quantities for roads/canal by: Mid-sectional area method, Mean sectional area method, Prismoidal method and Trapezoidal method Abstracting and Billing: Purpose of abstract, preparation of abstract, measurement and billing, Checking of bills and final bills.	12	25
4.	Rate Analysis: Definition of rate analysis, Factors affecting rate analysis, overhead expenses, procedure for rate analysis, schedule of rates, Definition of task, Determination of manpower and material requirement for a given quantity of items of civil works, study of present wages of labour and prices of traditional and modular materials in the market. Study of market rents of different construction tools plant and equipments, Determination of rate of different items of civil work. Working out rates of various items of civil works.	6	15
5.	Contract: Definition, legal requirements of a valid contract, types of contracts, conditions of contract, subcontracts and contractual disputes, Arbitration. Form of Contract, Responsibility of owner, Architect, Contractor and Engineer.	3	10
6.	Tender and Tender notice: Bidding process, e-tendering, Prequalification process, tender notice and its essential features, drafting tender notice, Bid submission, Analysis of tenders, Basis for evaluation and acceptance, letter of intent, work order, agreement.	3	10
7.	Valuation: Definitions of value, price and cost, depreciation, sinking fund, different type of values and their significance, factor affecting value, rent and standard rent, Lease hold and free hold property, obsolescence, Gross income, Outgoing and Net income, Capitalized value and Years purchase, valuation tables, Easement, types of easements, significance of easement in valuation, Methods of valuation of buildings and land, Estimation of values of different types of buildings and lands.	8	20



Suggested Specification table with Marks

Distribution of Theory Marks					
R	U	A	N	E	C
30%	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)

Course Outcome:

The practical exercises, the underpinning knowledge and the relevant soft skills associated with this competency are to be developed in the student to display the following COs:

1. Select the modes of measurements for different items of works.
2. Prepare rate analysis, specifications, tenders and contract of different civil work.
3. Prepare approximate and detailed estimate of a civil engineering work.
4. Utilize software for working out quantities of items of civil works.
5. Solve examples on valuation of properties/ buildings.

List of Text Books:

1. Estimating, Costing, Specification and Valuation In Civil Engineering" by M Chakraborti
2. Estimating, Costing and Valuation Book" by S.C. Rangwala, Charotar Publishing House.

List of Reference Books:

1. B. N. Dutta, Estimation and Costing in Civil Engineering, Ubs Publishers Distributors, Ltd.
2. G. S. Birdi, Textbook of Estimating & Costing, Dhanpat Rai and Sons, Delhi.
3. P.W.D. Handbook and SOR, IS Code – 1200.
4. A. S. Kotadia, Professional Practice and Valuation, Mahajan Publications.

Open e-Resource:

1. www.ensoftindia.com
2. www.newtonindia.com
3. www.estimator.com
4. nptel.ac.in

**List of Suggested Tutorials:**

1. Work out quantities of various items of civil works from working drawings of residential, industrial and commercial buildings.
2. Work out quantities of various items of civil works from drawings of culverts and retaining walls, L/s and C/s of Highways, etc.
3. To work out rates of items of civil works.
4. Examples of valuation of land and buildings.
5. Drafting specifications for various items of civil works.
6. Use of EXCEL, AutoCAD for calculation of Quantity.
7. Overview of software Revit, Tekla, BIM, MS Project, Primavera etc.



GANDHINAGAR INSTITUTE OF TECHNOLOGY

Bachelor of Technology Civil Engineering Department

Subject Code: 10020703	Subject Title: Minor Project
Pre-requisite: --	

Course Objective:

- To introduce students to the process of identifying and defining research or design-based engineering problems relevant to industry or society.
- To develop the students' ability to conduct literature reviews, formulate objectives, and propose appropriate methodologies under faculty guidance.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
0	0	12	06	0	0	80	20	100

Selection of project topic:

- The project topic must be selected in consultation with a faculty mentor and finalized only upon their approval.
- Topics should reflect the student's area of interest, and align with departmental research areas or industrial challenges.
- Projects may involve:
 - Literature surveys
 - Conceptual designs
 - Feasibility studies
 - Initial computational models
 - Simulation frameworks
 - Field surveys or data collection

Evaluation:

Criteria	Weightage
Regularity and Timely Submission (Continuous Assessment)	20 Marks
Problem Identification and Literature Review	15 Marks
Methodology Framing and Technical Content	25 Marks
Quality of Report (Structure, Referencing, etc.)	20 Marks
Oral Presentation and Communication Skills	20 Marks

Course Outcomes:

- Identify and define an engineering problem relevant to industry or societal needs.
- Conduct a comprehensive literature review using credible academic sources.
- Formulate clear objectives and propose feasible methodologies.



- Initiate technical work through conceptual design, analysis, or modeling.
- Communicate ideas effectively through presentations and technical reports.
- Work independently and collaboratively with ethical responsibility.



GANDHINAGAR INSTITUTE OF TECHNOLOGY
Bachelor of Technology Civil Engineering Department

Subject Code: 10020704	Subject Title: Internship
Pre-requisite: --	

Course Objective:

1. To provide students with exposure to industry practices and enhance practical knowledge.
2. To develop real-time technical and managerial skills through practical assignments.
3. To cultivate experience in project/report writing, technical presentations, and industry ethics.
4. To understand the impact of engineering solutions within societal and economic contexts.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
0	0	0	1	0	0	0	50	50

Types of Internships:

1. Offline Internship in Industry:

Students will be assigned to industry sectors where they will complete tasks under the guidance of an industry mentor. The completion of this internship requires submission of a joining and relieving letter from the respective organization.

2. Online Internship:

Students may participate in approved online internship programs, facilitated through platforms like Internshala or other AICTE-recognized bodies.

3. Mini-Project:

A hands-on mini-project related to the student's branch of study. This can be a fabrication, experimental analysis, simulation, or design/analysis of systems, and must be carried out individually by the student.

Internship Report and Evaluation:

• **Report Submission:**

A detailed report on the internship must be prepared and submitted by the student. The report will be evaluated by both the internal mentor (faculty) and an external industry mentor.

• **Continuous Evaluation – 50 Marks**

The evaluation will be based on continuous assessment throughout the internship. Both the internal mentor and external industry mentor will evaluate the student's performance on a continuous basis.

1. Internship Regularity & Task Performance (20 marks):

This includes the student's attendance, regularity, task completion, and proactive engagement in the assigned tasks. The internal mentor tracks the student's consistency, work ethics, and ability to carry out the tasks effectively.



2. Adequacy & Quality of Work (15 marks):

Evaluation of the quality, depth, and relevance of the tasks completed during the internship. This includes the execution of assigned tasks and how well the objectives of the internship were met.

3. Tools & Techniques Used (5 marks):

Assessment of the methods, tools, and techniques the student employed during the internship. The student will be evaluated on how effectively they used these tools to complete the work assigned by the industry mentor.

4. Report Quality & Presentation (10 marks):

The clarity, technical depth, and overall quality of the internship report. The presentation includes the student's ability to clearly and effectively communicate their work and findings.

Report Submission and Documentation:

- Internship report signed by both the internal and external mentors.
- Softcopy of the internship presentation approved by both mentors.
- A CD containing scanned copies of the report and presentation for departmental record.

Steps for Internship Completion:

• Joining Report Submission:

Upon joining the internship, students must submit a joining report to the institute.

• Continuous Assessment:

Students will be continuously assessed throughout the internship on their regularity, task performance, and the quality of their work and report.

• Midterm Evaluation:

The internal mentor will evaluate the student's progress midway through the internship.

• Final Report Submission:

After completing the internship, students will submit the final report for evaluation.

• Training Certificate:

Students must obtain a completion certificate from the industry, verifying their participation and successful completion of the internship.

Course Outcome:

Upon successful completion, students will have gained exposure to real-world industrial practices and developed technical skills to apply in future career opportunities.



GANDHINAGAR INSTITUTE OF TECHNOLOGY
Bachelor of Technology - Civil Engineering
Semester - VII

Subject Code: 10020705	Subject Title: Irrigation Engineering
Pre-requisite: Knowledge of hydrological cycle and its component, ground water hydrology, Basic ideas about Agricultural importance in India	

Course Objective:

- To develop basic understanding about Soil-water relationships, water requirements by various crops for efficient use of irrigation water.
- To create understanding about storage works, design of conveyance systems, knowledge of canal regulation devices and canal outlet works.
- To develop basic knowledge of various cross-drainage works falling across the alignment of canal is also required to an irrigation engineer.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	0	2	4	70	30	30	20	150

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Module 1: Irrigation Introduction- Definition, Necessity, Scope, Benefits and ill effects of irrigation, Types of irrigation schemes, Social and environmental considerations, Irrigation development and water resources potentials in India. Water Requirement of Crops- Methods of irrigation; Macro and micro, sustainable irrigation methods. Various modes of application of irrigation water Crop seasons in India, Principal Indian crops Soil-water-plant relation- field capacity, wilting point, available water, Consumptive use and its empirical methods, Irrigation requirements – Net irrigation requirement, Field irrigation	10	20



	requirement, Gross Irrigation requirement, Soil moisture extraction pattern, Frequency of irrigation, Gross command area, Culturable command area, Intensity of irrigation, Duty and delta relation, Irrigation efficiency, assessment of irrigation water		
2	Module 2: Diversion Works: Diversion head works, Weir and barrages, Various parts of diversion head works and their functions, Types of weir, Causes of failures of weir on permeable foundations, Principles of weir design on permeable formations - Bligh's creep theory, Lanes weighted creep theory and Khosla's theory, critical gradient, Exit gradient, Khosla's method of independent variables, location of hydraulic jump, basic factors for design of weir floor Storage works: Embankment dam: Classification of dams, site assessment and selection of type of dam, Environmental impacts of dam, Types of earthen dams, Methods of construction, causes of failures, Seepage in earth dams: Location of phreatic line in earthen dam, Rock-fill dams Gravity dams, Forces acting on a gravity dam, Modes of failure, load combinations for design of gravity dam, and stability analysis and design of gravity dam	15	25
3	Module 3: Distribution works: Modes of conveying irrigation water- Types of irrigation canals- contour canal, ridge canal, side sloping canals, canal alignment, Method of design of unlined section of irrigation canal, Kennedy's and Lacey's Silt theories, Silting and scouring of canals, Canal sections-filling, cutting, partial cutting and partial filling, Balanced depth, Canal FSL, Capacity factor and Time factor, Longitudinal section, Schedule of area statistics and channel dimension, canal losses Lined canals, Design of lined canal, Link canals	8	20
4	Module: 4 Regulating and Cross Drainage Works: Canal falls, development of various types of falls, Classification of falls and its selection, Cross drainage works, Types of cross drainage works and its selection, Design consideration of cross drainage work, Design discharge of drainage and waterway, uplift pressure Canal escapes, Head regulator and Cross regulator, Meter flume, Irrigation outlets and types of outlets.	8	20
5	Module: 5 Water logging: Causes and prevention, ill effects of waterlogging, Land Reclamation, management of irrigation water, Characteristics of irrigation water, Types of Drainage system	4	15

**Course Outcome:**

Sr. No.	CO statement
CO-1	Assess consumptive Irrigation requirement based on values of Duty and Delta of different crops and plan an irrigation system
CO-2	Design lined and unlined canals
CO-3	Plan diversion head works and design it based on piping and uplift theories
CO-4	Plan various irrigation canal structures in the canal network as per the site situation and requirement
CO-5	Analyze gravity and earth dams and identify type of spillway and energy dissipation work
CO-6	Select a suitable drainage system to reclaim waterlogged soil.

List of Tutorials:

Tut. No.	Tutorial Title
1.	Introduction
2.	Diversion Headworks
3.	Storage Works
4.	Distribution Works
5.	Regulating and Cross Drainage Works
6.	Water Logging

Text Books:

1. Irrigation & Water Power Engineering - Dr. B.C. Punmia & B.B.Pande, Laxmi Publications, (P) Ltd, New Delhi
2. Irrigation, Water Resources & Water Power Engineering - Dr. P.N.Modi, Standard Book House, Delhi
3. Irrigation, Water Power & Water Resources Engineering - Dr. K.R.Arora Standard Publishers Distributors, Delhi
4. Irrigation Engineering and Hydraulic Structures - S.K.Garg, Khanna Publishers, Delhi

**Reference Books:**

1. Irrigation Engineering, S.K. Mazumder, Galgotia Publications Pvt Ltd., New Delhi
2. Irrigation Engineering, G.L.Asawa, New Age publications, New delhi
3. Hydraulic Structures, P. Novak, A.I.B. Moffat, C. Nalluri and R. Narayanan, Taylor and Francis Group

Open e-Resource:

1. nptel.ac.in



Gandhinagar Institute of Technology (01)
Bachelor of Technology Civil Engineering Department
Semester-VII

Subject Code: 10020706	Subject Title: Design of Prestressed Concrete structures
Pre-requisite: Mechanics of Solids, Concrete Technology, Structural Analysis- I, Structural Analysis- II, Design of Structures-I	

Course Objective:

- This course is an elementary course on Design of Prestressed Concrete Structures. The course is specifically aim to familiarize with the basic concepts of prestressing and
- To develop understanding of various design philosophies, Indian Standard Codal provisions for the design of statically determinate Prestressed Concrete elements.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	0	2	4	70	30	30	20	150

Subject Contents				
Sr. No	Topic	Total Hours	Weight (%)	
1.	Introduction: Basic Concepts of Prestressing, Historical Development of prestressing, Materials and systems for prestressing, Types of Prestressing, Advantages and Limitations of Prestressing.	03	5	
2.	Losses in Prestress: Introduction, Losses due to Friction, Losses due to Anchorage Slip, Losses due to Elastic Shortening, Time-Dependent losses due Creep, Shrinkage and Relaxation, Total immediate losses, Total Time-Dependent losses, Illustrative Examples.	05	10	
3.	Flexural Design of Prestressed Concrete Elements: Introduction, Types of Flexural Failures, Selection of concrete section and	14	35	



	tendon profile, Strain Compatibility Method, Design of Pre-tensioned Beams, Design of Post-tensioned Beams, Design of Composite Prestressed Concrete Beams, Design of Simply supported Slabs, Camber, Deflection and Crack Control, End Block Design.		
4.	Shear and Torsional Strength Design: Introduction, Shear and Principal Stresses, Ultimate Shear Resistance of Prestressed Concrete Members, Design of Shear Reinforcements, Horizontal Shear strength in Composite Construction, Brackets and Corbels, Torsional behaviour and strength, Design for Combined Shear and Torsion.	12	30
5.	Prestressed Compression and Tension Members: Introduction, Types of prestressed Compression and Tension Members, their behaviour, Analysis and design of prestressed Compression and Tension Members.	8	20

Suggested Specification table with Marks

Distribution of Theory Marks					
R	U	A	N	E	C
5%	10%	30%	30%	20%	5%

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

Course Outcome:

The practical exercises, the underpinning knowledge and the relevant soft skills associated with this competency are to be developed in the student to display the following COs:

1. Apply the basic concepts of prestressing in various Civil Engineering Structures.
2. Assess the various prestressing losses in prestressed concrete elements as per Indian Standard Codal provisions
3. Analyse and design statically determinate prestressed concrete flexural elements and draught prestressing details.
4. Analyse and design the prestressed concrete elements for Shear and Torsion and draught detailing.
5. Analyse and design Prestressed Compression and Tension Members and draught prestressing details.



List of Reference Books:

1. T. Y. Lin and Ned H. Burns, Design of Prestressed Concrete Structures, 3rd Edition, John Wiley and Sons
2. Edward G. Nawy, Prestressed Concrete – A Fundamental Approach, 5th Edition, Pearson Education, Inc.
3. Arthur H. Nilson, Design of Prestressed Concrete, 2nd Edition, John Wiley and Sons
4. Antoine E. Naaman - Prestressed Concrete Analysis and Design – Fundamentals, 2nd Edition, Techno Press 3000
5. N. Krishna Raju, Prestressed Concrete, 6th Edition, McGraw Hill Education (India) Private Limited
6. N. Rajagopalan, Prestressed Concrete, 2nd Edition, Narosa publications
7. IS: 1343 – 2012, Prestressed Concrete – Code of practice

Open e-Resource:

1. <https://nptel.ac.in/courses/105/106/105106117/>
2. <https://nptel.ac.in/courses/105/106/105106118/>
3. <https://www.pci.org/>
4. <https://www.post-tensioning.org/>

List of Suggested Tutorials:

1. The students will have to solve at least five examples and related theory from each topic as an assignment/tutorial.
2. Prepare sketches of structural detailing of Prestressed Concrete Elements in sketch book/A3 size sheet.
3. Experiments may be designed and carried out related to the topics of the course such as Design, casting, prestressing and testing of Prestressed Concrete Elements.
4. Site Visit may be arranged related to the topics of the course such as Post-Tensioned / Pre Tensioned Prestressed Concrete Beams, PT Slabs, Prestressed Sleepers, Electric Poles, etc.
5. Practical examinations shall consist of oral based on term-work and above course



GANDHINAGAR INSTITUTE OF TECHNOLOGY
Bachelor of Technology Civil Engineering Department

Subject Code: 10020801	Subject Title: Major Project
Pre-requisite: --	

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
0	0	22	11	0	0	100	100	200

Course Objective:

- To develop students' ability to identify, define, and systematically approach real-world research problems, ensuring alignment with industry and societal needs.
- To equip students with modern research tools, techniques, and ethical practices, fostering effective teamwork and enhancing their communication skills for professional success.

Selection of project topic:

The research project will be closely aligned with the objectives of the engineering program and its specialized fields, fostering a culture of research among students. It may focus on contemporary technological advancements in engineering, incorporating computational methods, system or process analysis, evaluation of construction/fabrication/production or testing techniques, as well as design methodologies, analytical formulation, and problem-solving approaches. Students will have the opportunity to undertake an in-depth research project at an academic institution, R&D organization, or industry, concentrating on areas such as process enhancement or development, simulation, software development or application, integration of software and hardware, data analysis, surveys, prototype design, product development, laboratory experiment setup fabrication, literature reviews with new insights, industrial problem-solving research, and the design of sustainable infrastructure systems.

The project topic must be chosen in consultation with a faculty member. The topic will be finalized only after receiving approval from the faculty. Each student is required to provide regular progress updates to the assigned faculty, and a record of these updates must be maintained.

Submission of the Project Report:

Bound copies of the report should be submitted within the given deadline to the designated faculty.

Evaluation of the project will be done based on the following criteria:

- Technical Content: Considerations will be given for Analysis and Design
- Quality of Technical Report
- Contents of Presentation
- Overall sincerity and regularity

**Evaluation:**

In general, the student will submit a good technical report and make a power point presentation of roughly about 30-45 minutes.

Course Outcomes:

1. Identify and define a research problem addressing both industry needs and societal challenges.
2. Develop research methodologies with a comprehensive, systematic, and structured approach.
3. Choose and apply modern tools and techniques that are appropriate for solving real-world problems.
4. Engage in collaborative activities and demonstrate effective teamwork.
5. Uphold ethical standards and practices during the research project.
6. Understand the potential scalability of the research and the scope of intellectual property rights.
7. Compile, present, and communicate the research findings effectively to peers, faculty, and mentors.
8. Cultivate lifelong learning skills to support continuous professional development and career growth.



GANDHINAGAR INSTITUTE OF TECHNOLOGY
Bachelor of Technology Civil Engineering Department

Subject Code: 10020802	Subject Title: Technical Seminar
Pre-requisite: --	

Course Objective:

- To develop the ability to explore, analyze, and synthesize technical literature on emerging topics in respective engineering domain.
- To foster self-directed learning, enhance analytical reasoning, and strengthen the ability to engage with technical queries in academic and professional forums.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
0	0	2	1	0	0	0	50	50

Course Description:

This course provides a platform for students to investigate and present a technical topic of relevance to their discipline. Students will select a topic in consultation with a faculty mentor, perform a critical literature review, prepare a structured technical report, and deliver a formal presentation. Participation in peer seminars is mandatory to promote collaborative learning and feedback exchange.

Course Deliverables:

Deliverable	Description
Seminar Topic Approval	Student proposes topic in consultation with assigned faculty guide.
Literature Review Summary	Minimum of 10 journal articles; focus on problem definition and gaps.
Seminar Report	Structured report (approx. 15–20 pages) with standard referencing (APA/IEEE).
Presentation	15-20-minute seminar followed by Q&A session.
Participation Log	Attendance and feedback during peer seminars.

Evaluation Scheme (Continuous Assessment – 50 Marks):

Component	Weightage
Topic Relevance & Clarity	5 Marks
Depth of Literature Review	10 Marks
Technical Content & Originality	10 Marks
Report Structure & Quality	10 Marks
Oral Presentation & Communication	10 Marks
Response to Questions	5 Marks

**Course Outcomes:**

After completing this course, students will be able to:

1. Select and explore a contemporary technical topic in their engineering discipline.
2. Conduct a structured literature review and identify knowledge gaps.
3. Prepare a professional seminar report with proper citations.
4. Deliver effective presentations using appropriate visual tools.
5. Respond confidently and thoughtfully to technical questions.
6. Demonstrate academic integrity and communication ethics.