



Gandhinagar Institute of Technology

Academic Regulation & Curriculum

for

Diploma Engineering

In

Artificial Intelligence and Machine Learning

D.TECH. PROGRAMME

w.e.f. 2026-27

Preamble

The members of the Artificial Intelligence and Machine Learning Department are committed to promoting knowledge, innovation, and technical skills in the fields of artificial intelligence, machine learning, and data science. The department aims to create a positive and practical learning environment where students are encouraged to develop problem-solving abilities, think creatively, work in teams, and gain hands-on experience to address real-world challenges using modern technologies.

The curriculum for the Diploma in Artificial Intelligence and Machine Learning program has been revised according to the guidelines of AICTE, UGC, and NCERT along with the New Education Policy (NEP) under Academic Regulation 2022, effective from the academic session 2026–2027. The program follows an Outcome-Based Curriculum (OBC) with a Choice-Based Credit System (CBCS), focusing on building strong technical foundations, practical knowledge, and employability skills through an industry-oriented and multidisciplinary approach.

To meet current technological trends and industry requirements, several emerging and skill-based subjects have been included in the syllabus, such as Fundamentals of Artificial Intelligence, Introduction to Machine Learning, Python Programming, Data Science Basics, Database Management Systems, Internet of Things (IoT), Cloud Computing, Computer Vision, Natural Language Processing, and Introduction to Robotics. In addition, students are provided exposure to Generative AI, AI Ethics, Automation Tools, and Smart Systems to prepare them for future opportunities in intelligent technologies and automation-driven industries.

Students are encouraged to enroll in MOOC courses, certification programs, and skill-development platforms to gain additional knowledge, improve practical competencies, and enhance career opportunities in advanced technologies.

The course coding system has been updated from the respective academic sessions as suggested by the Office of the Controller of Examinations. This change helps distinguish the revised curriculum from previous academic structures and ensures systematic academic management.

The curriculum and syllabi are regularly reviewed and updated through a structured feedback mechanism involving faculty members, industry experts, alumni, parents, and academic professionals. This ensures that the program remains practical, relevant, industry-focused, and aligned with future technological developments.

With a focus on practical learning, innovation, technical competency, and adaptability, the department aims to develop skilled diploma engineers, technicians, and aspiring professionals who can contribute effectively to the growing fields of artificial intelligence, machine learning, and digital technologies.

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1. Institutional Vision & Mission

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.

MISSION:

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

2. Program Objectives

Here are 8 Program Aims for Diploma in AIML in point-wise format:

1. **Basic and Discipline-Specific Knowledge:**

Apply knowledge of mathematics, science, computer fundamentals, artificial intelligence, machine learning, and data analytics to solve engineering and real-world problems effectively.

2. **Problem Analysis:**

Identify, analyze, and interpret well-defined problems using AI and ML techniques, algorithms, and data-driven approaches to develop appropriate solutions.

3. **Design and Development of Intelligent Solutions:**

Design, develop, and implement AI and ML-based applications, models, and systems to meet specified requirements and solve practical problems.

4. **Engineering Tools, Experimentation, and Testing:**

Use modern AI/ML tools, programming platforms, software frameworks, and data analysis techniques to conduct experiments, validate models, and evaluate performance.

5. **Engineering Practices for Society, Sustainability, and Ethics:**

Apply AI and ML technologies responsibly by considering societal needs, environmental sustainability, ethical practices, data privacy, and security concerns.

6. **Project Management and Teamwork:**

Apply engineering and project management principles individually and collaboratively to plan, execute, and manage AI/ML projects while communicating effectively with stakeholders.

7. **Innovation and Emerging Technologies:**

Develop the ability to explore emerging AI technologies, innovate intelligent solutions, and adapt to advancements in machine learning, deep learning, and data science.

8. **Life-Long Learning:**

Recognize the need for continuous learning and professional development to keep pace with rapid technological advancements in artificial intelligence, machine learning, and related fields.

3. Program Educational Objectives (PEOs)

PEO-I: Career Preparation

Prepare graduates for successful careers in Artificial Intelligence, Machine Learning, Data Science, and related fields through strong technical knowledge, professional competence, and readiness for higher education, research, and lifelong learning.

PEO-II: Technical Competence

Equip graduates with a solid foundation in mathematics, statistics, computer science, artificial intelligence, and machine learning principles to analyze data, develop intelligent systems, and solve complex computational problems effectively.

PEO-III: Innovation and Intelligent Problem Solving

Develop the ability to design, develop, and deploy innovative AI and ML-based solutions for real-world, multidisciplinary challenges while considering ethical, societal, and environmental impacts.

PEO-IV: Professional Ethics and Leadership

Foster professionalism, ethical use of artificial intelligence, effective communication, teamwork, and leadership qualities required for successful careers and responsible decision-making in technology-driven environments.

PEO-V: Lifelong Learning and Adaptability

Encourage continuous learning, research aptitude, entrepreneurial thinking, and adaptation to emerging technologies and advancements in Artificial Intelligence, Machine Learning, and related domains to meet evolving industry and societal needs.

4. Program Details

4.1 Program Structure & Duration

- Duration & Intake: 3 Years & 60 Seats
- Semesters: 6
- Mode: Full Time
- Credit Structure: As per NEP/AICTE / University norms
- Medium of Instruction: English

4.2 Eligibility Criteria for Admission

As per the ACPDC Gujarat government rules and regulations candidates who have passed the Secondary School Certificate (SSC/10th Standard) examination from a recognized Board with Mathematics, Science, and English as compulsory subjects, or equivalent qualification as approved by the competent authority, shall be eligible for admission to the Diploma in Artificial Intelligence program. Eligibility criteria shall be applicable as per AICTE, State Government, and University norms in force from time to time.

4.3 Admission Procedure

Admission to the Diploma in Artificial Intelligence program may be granted on the basis of merit obtained in the qualifying examination and/or as per the admission guidelines prescribed by the University and the competent regulatory authorities from time to time.

Candidates seeking admission may be required to complete the application process as notified by the University. Admission shall be offered based on eligibility, merit, document verification, and fulfillment of the prescribed admission requirements.

The University reserves the right to revise the admission procedure in accordance with applicable rules, regulations, and policy guidelines issued from time to time.

4.4 Credit Summary for D Tech Course in AIML with effect from 2026-2027

Sl. No.	Course Type	AIML Credit
1.	Humanities and Social Sciences including Management Courses	6
2.	Basic Science Courses	11
3.	Engineering Science Courses including Workshop, Drawing, Basics of Electrical / Mechanical / Computer, etc.	18
4.	Program Core Courses	60
5.	Program Elective Course Courses relevant to chosen Specialization / Branch	15
6.	Open Subjects – Electives from other Technical and/or Emerging Subjects	0
7.	Project Work, Seminar and Internship in industry or elsewhere	14
8.	Mandatory course Courses (Non-credit) [Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Traditional Knowledge]	0

	Total	124
9	Honours Courses	0
	Grand Total	124

Definition of Credit (as per UGC / AICTE):

- 1 Hour Lecture (L) per Week = 1 Credit
- 1 Hour Tutorial (T) per Week = 1 Credit
- 1 Hour Practical (P) per Week = 0.5 Credits
- 2 Hours Practical (Lab) per Week = 1 Credit
- **Range of Credits (as per UGC / AICTE):**

■ **Program Core Courses have the highest weightage (48.51%),** which is within the recommended AICTE/UGC range of **40–50%**, showing strong specialization focus in AIML.

■ **Program Elective Courses contribute 11.94%,** matching the suggested range of **10–15%**, allowing students flexibility in advanced and emerging topics.

■ **Project Work and Internship account for 11.19%,** which is aligned with the prescribed **10–15%**, ensuring practical exposure and industry readiness.

■ **Engineering Science Courses contribute 14.93%,** which is very close to the recommended **15–20%**, providing adequate technical foundation.

■ **Humanities & Social Science (4.48%) and Basic Science (8.96%) are slightly below the ideal AICTE/UGC range,** but this is often acceptable in specialization-oriented diploma programs like AIML.

5. Curriculum Structure

(Gandhinagar Institute of Technology 01)								
Program Name: Diploma			Branch Name (Code): AIML					
Semester / Year : 01 / 01								
NCrF LEVE L	Subject Code	Course Type	Subject Name	Credit	Hours per week			
					L	T	P	Total
NCR – 4.5	100000101	Basic Science Courses	Mathematics	4	3	1	0	4
	100000102	Humanities and Social Science, including Management Courses	Communication Skills in English	3	2	1	0	3
	100000103	Basic Science Courses	Applied Physics	4	3	0	2	5
	101190101	Professional Core Courses	Computer Application	4	2	0	4	6
	100000104	Humanities (Mandatory Non-Credit Courses – Audit Course)	Sports and Yoga	0	0	0	2	2
	101230101	Skilling Based Course	Engineering Workshop Practice	2	0	0	4	4
	101190102	Professional Core Courses	Introduction of C Programming GroupA	3	2	0	2	4
				20				28
Program Name: Diploma			Branch Name (Code): AIML					
Semester / Year : 02 / 01								
NCrF LEVE L	Subject Code	Course Type	Subject Name	Credit	Hours per week			
					L	T	P	Total
NCR – 4.5	100000201	Basic Science Courses	Applied Mathematics	4	3	1	0	4
	100000202	MOPECS (Mandatory Non-Credit Courses – Audit Course)	Indian Constitution	0	2	0	0	2
	100000203	IKS	Essence of Indian knowledge and Tradition	2	2	0	0	2
	101180201	Engineering Science	Environment and Sustainability	2	2	0	0	2

	Courses						
101200201/101180202	Professional Core Courses	Fundamental of Electrical and Electronic Engineering Group A	4	3	0	2	5
101190201	Professional Core Courses	Fundamental of Python	4	3	0	2	5
101230201	Professional Core Courses	Engineering Graphics	4	2	0	4	6
			20				26

Program Name: Diploma			Branch Name (Code):AIML					
Semester / Year : 03 / 02								
NCrF LEVE L	Subject Code	Course Type	Subject Name	Credit	Hours per week			
					L	T	P	Total
NCR – 5.0	101240302	Program Core	Basic Object-Oriented Programming	4	3	0	2	5
	101260302	Program Core	Computer System Organization	4	3	0	2	5
	101190302	Program Core	Introduction of Data Structures	4	3	0	2	5
	101260303	Program Core	Artificial Intelligence	4	3	0	2	5
	101260304	Program Core	Foundations of Computing	4	3	1	0	4
	100000301	Student Induction Program	Universal Human Values	3	2	1	0	3
				Total	23			

Program Name: Diploma			Branch Name (Code): AIML					
Semester / Year : 04 /02								
NCrF LEVE L	Subject Code	Course Type	Subject Name	Credit	Hours per week			
					L	T	P	Total
NCR – 5.0	101260401	Program Core	Fundamental of Machine Learning	4	3	0	2	5
	101270401	Program Core	Computer Networking	4	3	0	2	5
	101190401	Program Core	Introduction to Software Engineering	4	3	0	2	5
	101260402	Program Core	Programming Paradigms	4	3	0	2	5

101260403	Program Core	Statistics & Probability for AI	3	3	0	0	3
	Audit Course	Audit Course-I	0	2	0	0	2
100000401	IKS	Vedic Mathematics	2	2	0	0	2
		Total	21				27
	Audit Course-I						
101240404	Audit Course-I	Contributor Personality Development					
101190403	Audit Course-I	Integrated Personality Development Course					

Institute Name (Code): Gandhinagar Institute of Technology (01)

Branch Name (Code):

Program Name: Diploma

Branch Name (Code): AIML

Semester / Year : 05 / 03

NCrF LEVE L	Subject Code	Course Type	Subject Name	Credit	Hours per week			
					L	T	P	Total
NCR – 5.5	101260501	Program Core	Optimization Techniques	4	3	0	2	5
	101260502	Program Core	Image Processing	4	3	0	2	5
	101240503	Minor Project	Project-I	3	0	0	6	6
		Professional Elective	Professional Elective-I	4	3	0	2	5
		Professional Elective	Professional Elective-II	4	3	0	2	5
	101220503	Summer Internship	Summer Internship-I	3	0	0	6	6
			Total	22				32
		Professional Elective-I						
	101220501	Professional Elective-I	Basic of Information Security					
	101190502	Professional Elective-I	Fundamental of IOT					
		Professional Elective-II						
	101260503	Professional Elective-II	Foundation of Deep Learning					
		101190503	Professional Elective-II	Introduction to Cloud Computing				

Program Name: Diploma			Branch Name (Code): AIML					
Semester / Year : 06 / 03								
NCrF LEVE L	Subject Code	Course Type	Subject Name	Credi t	Hours per week			
					L	T	P	Total
NCR – 5.5	101260605	Program Core	Computer Vision	4	3	0	2	5
	101240602	Major Project	Project-II	6	0	0	12	12
		Professional Elective	Professional Elective-III	4	3	0	2	5
		Professional Elective	Professional Elective-IV	4	3	0	2	5
			Total	18				27
		Elective-III						
	101260602	Professional Elective-III	Robotics Fundamentals					
	101260603	Professional Elective-III	Cloud Computing for AI					
		Elective-IV						
	101260604	Professional Elective-IV	Smart Digital Healthcare System					
	101260601	Professional Elective-IV	Fundamental of Generative AI					

6. Teaching, Learning & Evaluation

6.1 Teaching Methodology

The program shall adopt:

- Classroom Teaching
- Laboratory Practical Sessions
- Tutorial Sessions
- Programming Practice
- Case Studies
- Expert Lectures
- Workshops / Seminars
- Project-Based Learning
- Mini Projects
- Industrial Visits
- Internship / Industrial Training
- AI-based Learning Tools
- Blended and Digital Learning

6.2 Attendance Rules

- Minimum 75% attendance shall be mandatory in each course.
- Students below prescribed attendance may not be permitted to appear in the examination.
- Additional attendance requirements may apply for laboratory work, industrial training, internships, and project work.

6.3 Examination and Evaluation System

6.3.1 Evaluation Components

- The evaluation may consist of Continuous Internal Evaluation (CIE) and End Semester Examination (ESE).
- Continuous Internal Evaluation (CIE) may include:
 - Mid-Semester Examination
 - Assignments
 - Programming Assignments
 - Practical Performance
 - Class Tests
 - Quiz / Viva Voce
 - Laboratory Work
 - Mini Project / Project Work
 - Presentation / Seminar

6.4 Suggested Weightage

- Continuous Internal Evaluation (CIE): 30%
- End Semester Examination (ESE): 70%

6.5 Passing Standards

- Minimum 50% marks in each component where applicable.
- Minimum 35% aggregate for passing the course/program or as prescribed by the University from time to time.
- Separate passing may be required in theory and practical examinations.

6.6 Grading System

The program shall follow the University grading norms as applicable from time to time.

6.6.1 Grade Table

Grade	Grade Points	From Marks	To Marks
AA	10	91	100
AB	9	81	90
BB	8	71	80
BC	7	62	70
CC	6	53	61
CD	5	44	52
DD	4	35	43
FF	0	0	34

6.7 Project Work / Industrial Training

Students shall undertake Project Work / Industrial Training / Internship as part of the curriculum.

Requirements may include:

- Project Proposal Presentation
- Periodic Review
- Practical Demonstration
- Final Report Submission
- Viva Voce Examination

The project work / industrial training shall be evaluated by internal and/or external examiners as per University norms.

7. Rules and Regulations

7.1 Rules for Promotion

A student shall be promoted to the next semester as per the University rules subject to fulfilment of academic requirements, minimum attendance, successful completion of prescribed coursework, practical work, and earning the required credits of the semester.

7.2 Maximum Duration for Completion

The maximum duration for completing the Diploma in Artificial Intelligence program shall be 6 years from the date of admission or as prescribed by the University from time to time.

7.3 Internship Guidelines

7.3.1 Students shall undergo mandatory internship / industrial training in:

- Software Companies
- IT Support Companies
- Web Development Companies
- Networking Companies
- Database Management Companies
- Government IT Departments
- Private IT Departments
- Start-up Companies

7.3.2 Students must submit:

- Internship Report
- Work Diary / Logbook
- Completion Certificate
- Presentation / Viva Voce

7.4 Discipline Rules

Students shall maintain discipline, professional ethics, and proper conduct within the institution during laboratory sessions, workshops, industrial visits, internships, project work, examinations, and all academic activities.

Students are expected to attend classes regularly, follow institutional rules and regulations, respect faculty members, staff, fellow students, and institutional property, and maintain academic integrity in assignments, practicals, projects, and examinations.

Any form of misconduct, ragging, indiscipline, use of unfair means in examinations, damage to institutional property, harassment, cyber misconduct, or behaviour affecting the academic environment shall be treated seriously and may result in disciplinary action including warning, suspension, cancellation of examination, withholding of results, or expulsion from the program as per University rules and applicable regulations.

Students shall also comply with all laboratory safety norms, ethical use of technology, and professional standards prescribed by the institution from time to time.

7.5 Anti-Ragging Policy

The program shall strictly follow:

- UGC / AICTE Anti-Ragging Regulations
- Anti-Ragging Affidavit requirements
- Institutional disciplinary procedures
- Ragging in any form is strictly prohibited inside or outside the campus

7.6 Ethical Use of Technology and AI Tools

Students are encouraged to use:

- Programming Software
- Development Tools
- Database Tools
- Networking Software
- AI Learning Platforms
- Testing Tools
- Cloud Computing Tools
- Project Management Tools

8. Student Support

8.1 Industry Collaboration

The department shall actively promote collaboration with software development companies, IT service organizations, web development firms, networking companies, cyber security organizations, government IT departments, private enterprises, and technology-based start-ups to enhance practical exposure and industry relevance of the Diploma in Artificial Intelligence program. Such collaborations may include internships, industrial training, live projects, expert lectures, workshops, industrial visits, consultancy assignments, skill development programs, certification activities, and placement support. The institution may also establish Memoranda of Understanding (MoUs) with industry partners and professional organizations for academic enrichment, technology support, innovation, and collaborative initiatives aimed at improving employability, entrepreneurship, and technical competency among students.

8.2 Research and Consultancy

The department shall encourage faculty members and students to actively engage in research, innovation, consultancy, and applied studies related to Artificial Intelligence, software development, networking, database management, cyber security, cloud computing, artificial intelligence, and emerging technologies. Students may undertake mini projects, software development projects, system design assignments, technical surveys, and practical studies as part of their academic and professional training. The institution may also undertake consultancy assignments for industries, businesses, government organizations, and private agencies in areas such as software solutions, web application development, networking solutions, database design, IT support services, and digital transformation projects. Participation in seminars, workshops, coding competitions, conferences, technical events, and collaborative research activities shall be encouraged to promote innovation and industry-oriented learning.

8.3 Library and Laboratory Facilities

Adequate library, laboratory, and digital learning facilities shall be made available to support effective teaching, practical training, research, and skill development under the Diploma in Artificial Intelligence program. The department shall facilitate access to relevant books, journals, e-resources, programming manuals, technical publications, online learning platforms, and software documentation related to Artificial Intelligence and emerging technologies. Necessary computing facilities, programming software, development tools, database systems, networking laboratories, internet access, cloud-based tools, and other technical resources required for practical and project-based learning shall also be provided to enhance technical knowledge, research capability, and professional competency among students.

8.4 Student Support and Mentoring

A structured system for student support, academic mentoring, and professional guidance shall be implemented for students enrolled in the Diploma in Artificial Intelligence program. The department shall facilitate academic counselling, mentoring, career guidance, project guidance, and skill development activities to assist students in their academic progression and professional growth. Students may also be provided opportunities for interaction with industry experts, participation in workshops, seminars, technical events, industrial visits, training programs, and extracurricular activities aimed at enhancing employability, leadership qualities, communication skills, and overall personality development. Necessary support mechanisms for addressing academic and personal concerns shall also be made available as per institutional policies.

8.5 Placement and Career Development

The department shall promote placement assistance and career development activities for students through

industry interaction, professional networking, technical training, internships, and campus engagement initiatives. Efforts shall be made to establish linkages with software companies, IT organizations, networking firms, web development companies, government departments, and technology-based enterprises to facilitate internships, live projects, industrial exposure, and employment opportunities for students. Career development activities such as aptitude training, resume preparation, interview skills, coding practice, soft skill development, entrepreneurship guidance, certification programs, expert sessions, and placement-oriented workshops may also be organized to enhance professional competency and employability of students.

9. Program Credibility

9.1 Executive Summary

The Diploma in Artificial Intelligence program is designed to develop technically skilled and industry-ready professionals with knowledge in programming, software development, database management, networking, web technologies, cyber security, and emerging computing technologies aligned with current industry requirements.

Every subject in the program is delivered by qualified faculty members and industry experts with academic and practical experience in the field of Artificial Intelligence, ensuring students gain both theoretical knowledge and practical exposure.

Faculty members from Artificial Intelligence and allied departments deliver specialized modules related to programming, software engineering, database systems, computer hardware, networking, cloud computing, artificial intelligence, and modern digital technologies.

Practical training is supported through laboratory work, project-based learning, internships, workshops, coding activities, industrial visits, and expert sessions from professionals working in the IT and software industry.

The curriculum is designed to meet current academic standards and industry expectations while building strong technical, analytical, problem-solving, and professional skills among students.

Graduates of the program are academically and professionally prepared for employment in software development, IT services, networking, technical support, database administration, web development, and related technology sectors, as well as for higher studies in engineering and computer applications.

The program is industry-oriented and focuses on practical learning, innovation, employability, entrepreneurship, and professional competency required in the modern digital and information technology environment.

9.2 Scope and Career Opportunities

Graduates of the program may work in:

- Software Development Companies
- IT Companies
- Web Development Firms
- Networking Companies
- Cyber Security Organizations
- Database Management Companies
- Government IT Departments
- Private IT Organizations
- Start-up Companies
- Technical Support Services
- Software Testing Companies

9.3 Potential Job Roles

- Software Developer
- Computer Programmer
- Web Developer
- Network Technician
- Database Assistant
- IT Support Executive
- System Administrator

- Software Tester
- Technical Support Engineer
- Hardware and Network Technician
- Junior Application Developer
- Computer Operator

9.4 Higher Study & Professional Opportunities

Students may pursue:

- B.Tech / B.E. in Artificial Intelligence or related fields
- BCA or other higher education programs in Computer Applications
- Advanced Diploma in specialized IT fields
- Professional Certifications in Programming, Networking, Cloud Computing, or Cyber Security
- Entrepreneurship / Start-up Opportunities in IT and Software Services

10. Collaborative Experimental Work

10.1 Basic Programming Practice

Students shall write, compile, and execute basic programs using C, C++, Java, Python, or other programming languages prescribed in the syllabus. Practical exercises may include variables, operators, loops, arrays, functions, file handling, and simple problem-solving programs. Students shall maintain practical records with program code and output.

10.2 Website Design Practice

Students shall design and develop simple web pages using HTML, CSS, and JavaScript. Activities may include creating web page layouts, forms, hyperlinks, tables, menus, image integration, and basic responsive design. Students shall submit website files along with screenshots and documentation.

10.3 Database Practical

Students shall perform practical exercises using database software such as MySQL, Oracle, or MS Access. Activities may include creating databases, tables, inserting records, updating data, deleting records, applying filters, joins, forms, and reports using SQL queries. Submission shall include database files and practical journal work.

10.4 Computer Hardware Identification

Students shall identify and study internal and external computer hardware components such as motherboard, processor, RAM, storage devices, monitor, keyboard, mouse, printer, and network devices. Students may prepare observation sheets based on hardware specifications and functions.

10.5 Computer Assembly and Disassembly

Students shall perform assembly and disassembly of a computer system in the laboratory under supervision. Activities may include connecting internal components, checking ports and cables, installing RAM and storage devices, and basic troubleshooting of hardware issues.

10.6 Operating System Installation

Students shall install operating systems such as Windows or Linux and perform system configuration. Practical work may include disk partitioning, formatting, software installation, user account creation, device configuration, and system maintenance.

10.7 Networking Practical

Students shall perform basic computer networking activities such as LAN setup, IP addressing, network sharing, cable connection, internet configuration, router settings, and troubleshooting of network issues. Networking practical may also include use of simulation software.

10.8 Software Installation Practice

Students shall install and configure programming software, IDEs, compilers, database tools, browsers, utility software, and other applications required for academic work. Students may also learn software updating, troubleshooting, and maintenance.

10.9 Mini Project Development

Students shall develop a small practical project individually or in groups based on software, web development, database applications, or computer hardware. Example projects may include calculator applications, library management systems, billing software, portfolio websites, or student record systems. Project work shall include coding, testing, documentation, and presentation.

10.10 Internet and Cloud Tools Practice

Students shall use internet-based platforms and cloud tools for practical learning. Activities may include email communication, online collaboration tools, cloud storage, online coding platforms, version control systems, digital documentation, and virtual project sharing.

10.11 Seminar / Technical Presentation

Students shall prepare and deliver presentations on emerging topics related to Artificial Intelligence such as Artificial Intelligence, Cyber Security, Cloud Computing, Data Science, Internet of Things, Web Technologies, or Software Development. Students may submit presentation files and seminar reports.

10.12 Industrial Visit / Internship

Students shall visit software companies, IT departments, hardware firms, networking organizations, or complete internship/industrial training to gain practical industry exposure. Students shall submit an internship report, training certificate, and presentation based on their learning experience.

10.13 Project Demonstration and Viva Voce

Students shall demonstrate their mini project or final project before faculty members or evaluation panel. Students shall explain the project objective, design, implementation, output, and technical concepts involved. Viva voce shall be conducted to assess practical knowledge, technical understanding, communication skills, and project execution ability.

11. Market Survey

A detailed market survey was conducted to analyze the current and future demand for professionals skilled in Artificial Intelligence and Machine Learning. The survey indicates that AI and ML technologies are rapidly transforming industries such as healthcare, banking, finance, manufacturing, retail, agriculture, education, cybersecurity, and automation.

Organizations are increasingly adopting AI-driven solutions for data analysis, predictive modeling, intelligent decision-making, customer service automation, and process optimization. Due to this technological shift, there is a growing demand for skilled professionals with knowledge of programming, machine learning algorithms, data handling, cloud computing, and AI tools.

The survey also highlights that companies ranging from startups to multinational organizations are actively recruiting candidates with AI and ML expertise. Major technology companies such as Google, Microsoft, Amazon, and IBM continue to invest heavily in artificial intelligence research, development, and deployment.

At the national level, initiatives like Digital India, Smart Cities, Industry 4.0, and automation in manufacturing have further increased the relevance of AI and ML education. The Indian job market is witnessing continuous growth in roles such as AI Technician, Data Analyst, Junior Machine Learning Engineer, Python Developer, Automation Specialist, and Business Intelligence Associate.

Based on the survey findings, introducing a Diploma program in Artificial Intelligence and Machine Learning is highly justified. The program will equip students with industry-relevant technical skills and improve employability in one of the fastest-growing technology domains globally.

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 program from time to time in accordance with University regulations, statutory requirements, industry developments, and academic needs.

In case of any ambiguity or dispute regarding interpretation of any provision of this manual, the decision of the University/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 program.

Annexure I: Detail Syllabus

GANDHINAGAR INSTITUTE OF TECHNOLOGY DIPLOMA 1st SEMESTER

Civil Engineering / Mechanical Engineering / Electrical Engineering / Electronics and
Communication Engineering / Computer Engineering / Information Technology /
Computer Science and Engineering / Artificial Intelligence and Machine Learning /
Cyber Forensic and Information Security

Subject Code: 100000101	Subject Title: Mathematics
Pre-requisite: Concept of Numbers, sets, and functions.	

Course Objective:

- (1) This course is designed to give a comprehensive coverage at an introductory level to the subject of functions and sets Basic elements of algebra.
- (2) The subject is classified under Basic Sciences and students are intended to know about the basic concepts and principles of Mathematics as a tool to analyze the Engineering problems.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
03	01	-	04	70	30	-	-	100

Subject Contents				
Sr. No	Topic	Total Hours	Weight (%)	
1	Concept of Numbers, Sets, Types of set, Basic Functions and its properties, operation on sets and functions, solve simple problems using concepts of Logarithms, exponential Functions.	6	15	
2	Units of Angles (degrees, grades and radians and their conversions), Allied & Compound Angles, Sum, difference formulae and their applications, Multiple –Submultiples angles, Graph of Sine and Cosine, Periodic function, sum and factor formulae, Inverse trigonometric function	8	20	
3	Vector Algebra: Definition notation and rectangular resolution of a vector. Addition and subtraction of vectors. Scalar and vector products of 2 vectors. Simple problems related to work, moment and angular velocity.	10	25	
4	Complex Numbers: Complex Numbers: Definition, real and imaginary parts of a Complex number, polar and Cartesian, representation of a complex number and its conversion from one form to other, conjugate of a complex number, modulus and amplitude of a complex number Addition, Subtraction,	10	20	

	Multiplication and Division of a complex number. De-movier's theorem, its application.		
5	Determinant and Matrix, Addition/Subtraction, Product, consistency of equations, Inverse up to 3X3 matrix, Crammer's rule, Solution of Simultaneous Equations (up to three variables)	8	20

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

1. Understand the core concept of sets and functions.
2. To acquire necessary background in Trigonometry to appreciate the importance of the geometric study as well as for the calculation and the mathematical analysis.
3. To get acquainted with concepts to vector algebra.
4. To study complex numbers that enter studies of physical phenomena in ways that most people cannot imagine. Apply the basic principles of probability theory in problem solving situations.
5. To acquire necessary background in Determinants and Matrices so as to appreciate the importance of the Determinants are the factors that scale different parameterizations so that they all produce same overall integrals, i.e. they are capable of encoding the inherent geometry of the original shape.

List of Textbooks:

1. W R Neelkanth, Applied Mathematics-I, Sapna Publication.
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 40th Edition, 2007.
3. G. B. Thomas, R. L. Finney, Calculus and Analytic Geometry, Addison Wesley, 9th Edition, 1995.

List of Reference Books:

1. Anthony croft and others, Engineering Mathematics (third edition), Pearson Education
2. Reena Garg, Engineering Mathematics, Khanna Publishing House, New Delhi (Revised Ed. 2018)
3. V. Sundaram, R. Balasubramanian, K.A. Lakshminarayanan, Engineering Mathematics, 6/e., Vikas Publishing House.

Subject Code: 100000102	Subject Title: Communication Skills in English
Pre-requisite: Basic Communication Skills	

Course Objective:

- To develop an extensive vocabulary, enhancing their comprehension, communication, and critical thinking skills.
- To make the students understand the importance and appropriate use of Communication.
- To familiarize the students with basic LSRW as well as Communication Skills.
- To develop presentation skills and technical writing skills.

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	Vocabulary: Definition and ways to build vocabulary, word formation and its types, antonyms and synonyms, one word substitutions	5	15	
2	Communication: Definition of communication, types of communication, importance of communication, process of communication, barriers of communication.	5	15	
3	Basics of Listening and Reading Skills: Listening Skills: Definition of listening and hearing, types of listening, barriers of listening, ways to improve listening, traits of a good listener. Reading Skills: Definition of reading, purpose of reading, types of reading, ways to improve reading skills	7	25	
4	Basics of Speaking and Writing Skills: Speaking Skills: Definition of speaking, barriers of speaking, ways to improve speaking, qualities of a good speaker. Writing Skills: Definition of writing, things one should keep in mind while writing, ways to improve writing skills. Technical Writing: Letter writing, E-mail writing	10	30	
5	Presentation Skills: Defining the purpose of presentation, how to make an effective presentation: analyzing audience and locale, organizing content and preparing an outline, importance of body language in presentations, Do's and Don'ts. of presentation	5	15	

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

- Understand the importance of vocabulary in everyday use.
- Develop strategies to communicate effectively and appropriately.

- Develop listening and reading skills that help to excel in the professional field.
- Develop general speaking fluency and writing skills.
- Master effective presentation techniques, improving their ability to communicate ideas clearly and engage their audience.

List of References:

1. Technical English, Dr. M. Hemamalini, Wiley. 2014.
2. Communication Skills, Sanjay Kumar and Pushp Lata, Oxford University Press. 2011.
3. Technical Communication – Principles and Practice, Third Edition by Meenakshi Raman and Sangeetha Sharma, Oxford University Press 2017.
4. English Communication for Polytechnics- S. Chandrashekhar & Others, Orient BlackSwan 2013- ISBN : 8125037462

Open e-Resource:

- <https://learnenglish.britishcouncil.org>
- <http://www.free-english-study.com/>
- <http://www.english-online.org.uk/course.htm>
- <http://www.english-online.org.uk/>
- <http://www.talkenglish.com/>
- <http://www.learnenglish.de/>
- <https://www.cambridgeenglish.org/exams-and-tests/linguaskill/>
- <https://dictionary.cambridge.org/dictionary/english/>
- <https://www.oxfordlearnersdictionaries.com/definition/academic/>
- <https://learnenglishkids.britishcouncil.org/>

List of Suggested Exercise:

1. Vocabulary Building: Practice
2. Role Play
3. Listening Skill: Practice
4. Speaking Skill: Practice
5. Reading Practice: Reading of Paragraphs
6. Writing Practice: Letter and Email Writing
7. Presentation Practice

Subject Code: 100000103	Subject Title: Applied Physics
Pre-requisite: Students must comprehend motion, force, and units fundamentally.	

Course Objective:

- The goal of applied physics is to provide an understanding of the environment around us through both observation and behavior prediction.
- The course material has a strong emphasis on the practical application of physical principles and analysis in a range of engineering and technology domains.
- The training will assist diploma engineers in using fundamental ideas and principles to address a variety of engineering challenges and comprehend various technology-based applications.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lectur e	Tutoria l	Practica l	Credi t	Theory		Practical		Total
				University Assessmen t	Continuou s Assessmen t	University Assessmen t	Continuou s Assessmen t	
03	-	02	04	70	30	30	20	150

Subject Contents				
Sr. No	Topic	Total Hours	Weight (%)	
1	SI Units & Measurements Need of measurement and unit in engineering and science, definition of unit , requirements of standard unit, systems of units-CGS,MKS and SI, fundamental and derived quantities and their units, Least count and range of instrument, least count of vernier caliper, micrometer screw gauge, Definition of accuracy, precision and error, estimation of errors -absolute error, relative error and percentage error, rules and identification of significant figures.	6	14	
2	Force and Motion: Recapitulation of equations of motion, Newton's 1 st law of motion, Force, basic forces in motion, gravitational force, electrostatic force, electromagnetic force, nuclear force, Inertia, types of inertia (inertia of rest, inertia of motion, inertia of direction), Momentum, Newton's 2 nd law of motion, measurement of force using second law, simple problems on $F = ma$ and equations of motion, Impulse of force, Impulse as the product of force and time, impulse as the difference of momentum, examples of impulse, simple problems on impulse, Newtons 3 rd law of motion and its examples. Law of conservation of momentum, Statement, simple problems (Numerical on above topics)	10	24	
3	Electricity and Magnetism: Concept of charge, Coulomb's inverse square law, Electric field, intensity, potential and potential difference, Electric current, Ohm's law, laws of series and parallel combination of resistance, D.C. circuits, Kirchhoff's law, heating effect & chemical effect of current,	10	24	

	Magnetic field and its units, magnetic intensity, magnetic lines of force, magnetic flux and their units, Dia, Para, Ferro magnetic materials, Electromagnetic Induction, Lenz's law and its Applications, Alternating current and its waveform		
4	Waves and Acoustics of Building: Definition of wave motion, amplitude, period, frequency, and wavelength, relation between velocity, frequency and wavelength, longitudinal and transverse wave, principle of superposition of waves, definition of stationary wave, node and antinode, definition of resonance with examples, Formula for velocity of sound in air. Importance of Reverberation, Reverberation time, Optimum time of Reverberation, Coefficient of absorption of Sound, Sabine's formula for Reverberation time, Factors affecting Reverberation time and acoustics of building.	10	24
5	Radioactivity: Radioactivity Definition, Natural & Artificial radioactivity, Units and Laws of Radioactivity, Half Life, Average Life & Decay Constant, Radioactive Rays, Properties and uses of alpha particles, beta particles and gamma rays (Numericals on Above topics)	6	14

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

6. Explain Physical Quantities and their units.
7. Measure given dimensions by using appropriate instruments accurately and calculate error in the Measurement.
8. Differentiate among various forces in nature
9. Define inertia, momentum and impulse of force and State Newton's laws of Motion and law of conservation of momentum.
10. State Coulomb's law, Ohm's law and Kirchhoff's law.
11. Explain Electric field, potential, potential difference, field intensity, electric current, resistance, heating and Chemical effect of current and apply laws of series and parallel combination to electrical circuit.
12. Explain electromagnetic induction and its uses.
13. Distinguish between dia, para and ferro magnetic materials.
14. Distinguish between transverse and longitudinal waves.
15. Define period, frequency, amplitude and wavelength
16. Explain principle of superposition of waves
17. Comprehend the Importance of Reverberation time using Sabine's formula and factors affecting Reverberation time.
18. Explain ultrasonic waves and its applications.
19. Define radio activity and Distinguish between Natural & Artificial radioactivity
20. State relation between Half Life, Average Life & Decay Constant.
21. Describe properties of Alpha, Beta and Gamma rays.

List of References:

1. University Physics by Sears and Zeemansky, Pearson Publication.
2. Conceptual Physics by Paul G Hewitt, Pearson Publication.
3. Engineering Physics by G Vijayakumari 4th Edition, Vikas-Gtu Students' Series.
4. Engineering Physics by Dattu R Joshi, McGraw hill Publications.
5. Resnick, Halliday and Krane, Physics part I and II, 5th Edition John Wiley India Publications (2002).
6. Physics for scientists and engineers with modern physics by Jewett & Serway, Cengage publications.

7. Physics Part 1 and 2, NCERT.
8. Concepts of Physics by H C Verma, Bharti bhavan Publications (2nd Edition).

Open e-Resource:

1. The Feynman Lectures series on Physics Vol 2, Pearson Education India
2. www.physicsclassroom.com
3. www.physics.org
4. www.fearofphysics.com
5. www.sciencejoywagon.com/physicszone
6. www.science.howstuffworks.com

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.
9. Determine the dielectric constant of Solid Materials.
10. Determine the ultrasonic velocity using ultrasonic interferometer.

Subject Code: 101190101	Subject Title: Computer Applications
Pre-requisite: Zeal to learn	

Course Objective:

- To understand various Basics of Computer System
- To understand the concept of Using MS -Word 2007
- To gain knowledge of MS - Excel 2007
- To gain basic knowledge of MS – PowerPoint 2007

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	0	50	30	20	100

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Basics of Computer System: Concept of Hardware and Software, Computer block diagram, Input Output unit, CPU, Control Unit, Arithmetic logic Unit (ALU), Memory Unit, Concept of Monitor, Printers: Dot matrix, Laser, Inkjet, Plotters, Scanner, System software and Application Software, Operating system concepts, purpose and functions, Operations of Windows OS, Creating and naming of file and folders, Copying file, renaming and deleting of files and folders, Searching files and folders, installation application, creating, shortcut of application on the desktop, Overview of control Panel, Taskbar.	3	9
2	Using MS - Word 2007 : Overview of Word processor, Basics of Font type, size, colour, Effects like Bold, italic , underline, Subscript and superscript, Case changing options, Inserting, deleting, undo and redo, Copy and Moving (cutting) text within a document, Formatting Paragraphs and Lists, Setting line spacing; single, Page settings and margins including header and footer, Spelling and Grammatical checks, Table and its options, Inserting rows or columns, merging and splitting cells, Arithmetic Calculations in a Table, Working with pictures, Inserting Pictures from Files, Drawings and WordArt; Lines and Shapes, Modifying Drawn Objects, Formatting Drawn Objects, options for Creating and Modifying a WordArt Object	3	24
3	Using MS - Excel 2007: Introduction to Excel 2007, Introduction to data, Cell address, Excel Data Types, Concept of, hyperlink, Introduction to formatting, number, text and date formatting, Concept of worksheet and workbook, Understanding formulas, Operators in Excel 2007, Operators Precedence, Understanding Functions, Common Excel Functions such as sum, average, min, max, date, transpose, In, And, or, sqrt, power, upper, lower, Types of graphics : Word art, auto shapes, Images Introduction to	3	12

	charts, overview of different types of charts, available with Excel, Concept of print area, margins, header, footer and other page, setup options		
4	Using MS - PowerPoint 2007: Outline of an effective presentations, Starting a New Presentation Files, Saving work, Creating new Slides, Working with textboxes. Changing a slides Layout, Applying a theme, Changing Colours, fonts and effects, Creating and managing custom Colour & font theme, Changing the background Managing slides master, Managing theme. Changing the font, font size, font colour, text fill, Adjusting character spacing and line spacing Formatting text boxes. Word arts, styles, Formatting bulleted lists and numbered list, Finding and replacing text, Correcting your spelling, Creating a new and editing a table's structure, Selecting, deleting, moving, copying, resizing and arranging, objects, Working with drawing tools, Applying shape or picture styles, Applying object borders, object fill, object effects, Working with clip art collection and modifying clip art, Embed a video, Link to a video, Size a video, Video playback options, Configuring a sound playback, Assigning sound to an object, Adding a digital music sound track, Transition effects and timings, Creating hyperlinks, Using action buttons	5	9

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

- Hands-on experience on different application software used for office automation like MS-Word
- write, Draw, Tabulate, Report, Store and Retrieve and also print on Computer using various Hardware and Software.
- Hands-on experience on different application software used for office automation like MS-Power point
- Hands-on experience on different application software used for office automation like MS-Excel

List of References:

1. R Taxali Computer Course Tata McGraw Hills. New Delhi.
2. De Levie, Robert, "Advanced Excel for Scientific Data Analysis", Oxford University Press, 2004.
3. Peng, Roger D, Matsui, Elizabeth, "The Art of Data Science: A Guide for Anyone who Works with Data", Lulu.com, 2016.

Open e-Resource:

- (1) <https://support.microsoft.com/en-us/excel>
- (2) https://support.google.com/docs/topic/9054603?hl=en&ref_topic=2811805
- (3) <https://www.datacamp.com/>
- (4) <https://www.khanacademy.org/>
- (5) <https://exceljet.net/>

List of Suggested Experiments:

1. Identify the internal and external hardware/peripheral components
2. To work with the Google Workspace/ Google Products, to compose, mail and work with google drive / forms

3. To work with the basic features of MS Word.
4. To Create your Resume / Bio Data.
5. To work with the MS Word, Mail Merge.
6. To work with the basic features of MS Excel.
7. To work with the basic features of MS PowerPoint
8. To get an Introduction with Open Office.

Subject Code: 100000104	Subject Title: Sports and Yoga
Pre-requisite: Zeal to learn	

Course Objective:

- Apply sports and yoga activities to keep the body physically and mentally fit.

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	0	0	0	50	0	50

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Perform following Yoga Asanas under the guidance of yoga trainer :- Surya Namaskar (Sun Salutation) Tadasana (Mountain pose) Vrikshasana (Tree pose) Vajrasana (Hand under foot pose) Pada-hasthasana (Hand under foot pose) Ushtrasana (Camel pose) Dhanurashana.(Bow Pose) Bhjangasana (Snake pose) Halasana (Plough pose) Shavasana/Yoga Nidra Bhastrikai Pranayam Kapalbhati Pranayam Anulom Vilom Pranayam Bhramari Pranayam	12	40
2	Participate in any sports activities of your choice: Indoor sports/games (Badminton, Chess, Carrom, Table Tennis) Outdoor sports/games (Cricket, Kabaddi, Volleyball, Basketball, Football, Hockey)	14	40
3	Prepare report on any sports events including associated rules, playground specification, rules for judgement, etc.)	2	20

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

- Practice physical activities and yoga for strength, flexibility and relaxation.
- Use techniques for increasing concentration and decreasing anxiety for stronger academic performance.

- Perform yoga exercises in various combination and forms.
- Improve personal fitness through participation in sports and yoga activities.
- Follow sound nutritional practices for maintaining good health and physical performance.

List of References:

1. Modern Trends and Physical Education class 11 & class 12 Ajmer Singh Kalyani Publication, New Delhi ISBN : 9789327264319
2. Light on Yoga B.K.S. Iyengar Thomson's Publication, New Delhi ISBN: 8172235011
3. Health and Physical Education V.K.Sharma NCERT Books; Class11,12 📖 Saraswati House Publication, New Delhi
4. Yoga and Stress Management Acharya Yatendra Fingerprint Publishing ISBN: 938905303X
5. Patanjali Yoga SutrasSwami Vivekanand Fingerprint Publishing ISBN: 9389567351
6. Pranayam Rahasya Ramdev Patanjali-Divya Prakashan, Haridwar ISBN: 978-8189235017
7. Yoga its Philosophy & Practice Ramdev Divya Prakashan, Haridwar

Open e-Resource:

1. <https://youtu.be/dAqQqmaI9vY>
2. <https://youtu.be/c8hjhRqIwHE>
3. <https://youtu.be/MrR04m1zoJ8>
4. <https://youtu.be/P-jwGj7YqNM>

List of Suggested Experiments/activities:

- a) Prepare a list of specifications for various tools/equipment/machines used in gymnasium/indoor sports complex.
- b) Undertake a market survey of local dealers for procurement of sports items/ equipment/machines.
- c) Visit the sports shop and collect all relevant information about any sport item and submit the detailed report.
- d) Download video clips showing correct practices for yogasanas, pranayam and any sports/games.
- e) Prepare a chart showing different types of yogasanas.
- f) Prepare a chart showing different types of pranayams.

Subject Code: 101230101	Subject Title: Engineering Workshop Practice
Prerequisite: Zeal to learn the subject	

Course Objective:

1. Workshop practice is the backbone of the real industrial environment which helps to develop and enhance relevant technical hand skills required by the technician working in the various engineering industries and workshops.
2. Irrespective of branch, the use of workshop practices in day to day industrial as well domestic life helps to dissolve the problems

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	4	2	0	0	80	20	100

Subject Contents			
Sr No	Topic	Total Hours	Weight (%)
1	Familiarization to workshop practices	6	6
2	Learning skills to use tools, machines, equipments and measuring instruments	6	13
3	Follow safety rules for safe handling of machines and tools	6	6
4	Practice exercise with hands on training in different workshop trades	24	44
5	Hands on training for Welding and practice Plumbing functioning	6	13
6	Hands on practice for Carpentry and Fitting operations	8	18

Course Outcome:

After completion of this course, student will be able to

CO1	Students will learn about different workshop trades
CO2	Students will identify and apply suitable tools and instruments for fitting, carpentry, smithy and basic electrical work
CO3	Students will learn about taking safety and precautionary measures of self and machines during operations

CO4	Students will have awareness about measure of different welding operations and plumbing skills
CO5	Students will be aware about conducting exercises with wooden job as well as metal specimen

List of References:

1. B S Raghuwanshi, "A course in Workshop Technology", Dhanpat Rai Publications
2. P.N. Rao, "Manufacturing Technology Vol-I and Vol-II", Tata McGraw Hill
3. Kalpakjian, "Manufacturing Engineering and Technology", Pearson
4. K Hajra Choudhury, A K. Hajra, "Elements of Workshop Technology: Vol- I and Vol - II", Media Promoters Pvt Ltd.
5. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGraw Hill House, 2017

Open e-Resources:

1. <https://nptel.iitm.ac.in/courses.php>

List of Suggested Experiments:

1. Familiarization to different shops in workshop and its layout
2. To understand safety measures followed in workshop practice
3. Machine shop in Workshop
4. Hands on Practice and job making in Carpentry shop
5. Hands on Practice in Plumbing shop
6. Hands on Practice and job making in Fitting shop
7. Demonstration of Pattern Making by sand molding
8. Demonstration of different Welding operations

Subject Code: 101190102	Subject Title: Introduction of C Programming
Pre-requisite: Nil	

Course Objective:

- To understand the various steps in Program development.
- To understand the basic concepts and gain the knowledge in C Programming Language.
- To learn how to write modular and readable C Programs.
- To learn to write programs (using structured programming approach) in C to solve problems.

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	2	3	70	30	30	20	150

Subject Contents				
Sr. No	Topic	Total Hours	Weight (%)	
1	Introduction: Basic block diagram and functions of various components of computer, Concepts of Hardware and software, Types of software, Compiler and interpreter, Concepts of Machine level, Assembly level and high level programming, Flowcharts and Algorithms	3	15	
2	Fundamentals: Introduction to C, structure of C Program, comments, header files, data types, constants, variables, declarations, expression statements, arithmetic operations, unary operations, relational and logical, conditional, library functions, single character input and output, entering and writing data, evaluation of expressions, type conversion, precedence and associativity, I/O functions.	4	20	
3	Control structure in C: Simple statements, Decision making statements, Looping statements, Nesting of control structures, break and continue, The case control structure switch and goto statement.	5	20	
4	Array & String: Concepts of array, processing an array, declaration and initialization of arrays, passing arrays to function, multidimensional array, string, string storage, Built-in string functions, command line arguments.	5	15	
5	Functions: Concepts of user defined functions, prototypes, definition of function, parameters, parameter passing, calling a function, recursive function: different way of solving problems, recursive program for finding factorial, Fibonacci series etc.	8	30	

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

- To formulate a flowchart/algorithm for a given a problem.
- To translate algorithm/flowchart into a c program using correct syntax and execute it.
- To develop a c program using the concept of array and structure.
- To decompose a problem into function.

List of References:

1. Programming in ANSI C, Balagurusamy, TMH
2. Lets C, Y. Kanitkar, BPB
3. Programming with C, Gottafried, Schaum Series
4. C The Complete Reference, Scholdt, TMH
5. Structured Programming Approach Using C, B. Forouzen, Thomas

Open e-Resource:

1. NPTEL C Programming: <https://nptel.ac.in/courses/106104128>
2. NPTEL Problem Solving through C: https://onlinecourses.nptel.ac.in/noc22_cs101/preview
3. https://www.w3schools.com/c/c_compiler.php
4. <https://www.geeksforgeeks.org/c-programming-language/>

List of Suggested Experiments:

1. Draw Flow Chart and write algorithm for at least four problems.
2. Write a minimum 5 programs using Constants, Variables & arithmetic expression in C.
3. Write programs to understand Data types, Type modifiers and Type conversion in C.
4. Write programs providing insight to formatted and unformatted input and output in C
5. Write minimum 5 programs providing understanding of Relational operators in C.
6. Write programs using logical and bitwise operators in C.
7. Make programs using If, If-else, If-else-if and Nested If statements.
8. Make programs using break, continue, goto and switch statements.
9. Write programs to understand simple for loop and nested loops.
10. Write programs using While Loop and do-while loop.
11. Write programs on arrays. (Sorting, merging, finding particular value etc.)
12. Write a program that defines the functions of add first n numbers.
13. Write a program using function to interchange two values in C.
14. Write a program to calculate the power using recursion in C.

GANDHINAGAR INSTITUTE OF TECHNOLOGY DIPLOMA 2nd SEMESTER
Civil Engineering / Mechanical Engineering / Electrical Engineering / Electronics and
Communication Engineering / Computer Engineering / Information Technology / Computer Science
and Engineering / Artificial Intelligence and Machine Learning / Cyber Forensic and Information
Security/ Information and Communication Technology

DOC NO: 4061

Subject Code: 101230201	Subject Title: Engineering Graphics
Pre-requisite: Zeal to learn	

Course Objective:

- Strengthen the engineering structure by demonstrating various graphical projections.
- Transmitting link between ideas and realization.
- 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	
2	0	4	4	70	30	30	20	150

Subject Contents				
Sr. No	Topic	Total Hours	Weight (%)	
1	Introduction to Engineering Graphics: 1. Introduction to drawing instruments and accessories. 2. Types of lines, dimensioning and plane scale as per BIS-SP 46. 3. Draw polygons with various methods. <i>(In Exam, specific method not to be asked. Students can draw polygon by any method.)</i>	4	10	
2	Engineering Curves: 1. Applications of Engineering Curves, Construction of Conical curves. 2. Drawing of cycloidal Curves, Involute and Spirals. <i>(In Exam, specific method not to be asked. Students can draw these curves by any method.)</i>	5	20	
3	Projections of Points and Lines: 1. Introduction to principal planes of projections, Projections of points. 2. Projections of line with its inclination to HP and VP, True length.	5	20	
4	Projections of Planes: Inclination of square, hexagonal and circular plane with reference planes.	4	10	

5	Orthographic Projections: 1. Projections from the pictorial view of the object. 2. Draw front, top and side views of simple objects. 3. Free hand sketches of simple geometrical shapes like square, triangle, circle, semi-circle, hexagon and pentagon.	6	20	
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6	Isometric view: 1. Isometric view of simple objects and Isometric scale. 2. Free hand sketches of simple objects like prism, pyramid, cylinder and cone.	6	20
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Course Outcome: After completion of this course, student will be able to

- Apply the conventions and methods of engineering drawing.
- Construct engineering curves as per given dimensions.
- Draw the projection of points, lines and planes under different conditions.
- Draw orthographic projection from isometric views of simple objects.
- Draw isometric views from orthographic projection of simple objects.

List of References:

1. A text book of Engineering Drawing by P.S.Gill, S.K.Kataria & sons, Delhi.
1. Elementary Engineering Drawing by N.D.Bhatt Charotar Publishing House, Anand.

Open e-Resource:

1. <https://nptel.ac.in/courses/112103019>
2. <https://nptel.ac.in/courses/112104172>

List of Suggested Experiments:

Students must draw all the problems in sketch book and then in drawing sheet.

1. Use of drawing instruments (Types of Lines, Dimensioning, Scale as per BIS, Angles, Polygons).
2. Drawing of Conical curves (Ellipse, Parabola, Hyperbola).
3. Drawing of Spiral, Involute and Cycloidal curves.
4. Projections of Points and Line.
5. Projections of Plane.
6. Draw Orthographic Projections of given Isometric View.
7. Draw Isometric View of given Orthographic Projection.

**GANDHINAGAR INSTITUTE OF TECHNOLOGY DIPLOMA 2nd
SEMESTER**

Electrical Engineering / Electronics and Communication Engineering / Computer Engineering / Information Technology / Computer Science and Engineering / Artificial Intelligence and Machine Learning / Cyber Forensic and Information Security/ Information and Communication Technology

DOC NO: 4061

Subject Code: 101200201	Subject Title: Fundamental of Electrical and Electronic Engineering (FEEE)
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.	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, 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.electronicsandyou.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 TECHNOLOGY
DIPLOMA 2nd SEMESTER

Civil Engineering / Mechanical Engineering / Electrical Engineering / Electronics and Communication Engineering / Computer Engineering / Information Technology / Computer Science and Engineering / Artificial Intelligence and Machine Learning / Cyber Forensic and Information Security/ Information and Communication Technology

DOC NO: 4061

Subject Code: 101190201	Subject Title: Fundamental of Python
Pre-requisite: Programming Concepts, basic computer skills, strong math foundation, and the ability to install Python and set up your development environment.	

Course Objectives:

- Understand Python syntax, data types, and operators, Implementation of control structures (loops, conditions, functions) and work with lists, tuples, dictionaries, and sets.
- Learn file handling and data processing with read and write files using Python, also work with CSV, JSON, and XML data Perform data manipulation using Pandas
- Learn to apply the functions in Python Programming to solve the problem

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: Installation and working with Python, Variables and data types in python, perform computations and create logical statements using Python's operators: Arithmetic, Assignment, Comparison, Logical, Membership, Identity, Bitwise operators, list, tuple and string operations	10	22
2	Python Loops: Conditional: if, if... else and nested if, Loops: for, while, nested loops, Break and Continue Statement.	8	17
3	Python Functions & Recursion: Function calls, Type Conversion and Coercion, Math Functions, Adding new Function, Parameters and Argument, Recursion and its use, Lambda Functions and Anonymous Functions in Python.	10	22
4	Python File Operations: An introduction to file I/O, use text files, use CSV files, use binary files, handle a single exception, handle multiple exceptions, Illustrative programs, Exercises	10	22

5	Advance Libraries: Use of Libraries: Numpy, pandas, matplotlib, Pillow, Keras, TensorFlow, Introduction to different framework in python	8	17
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Course Outcome: After completion of this course, students will be able to

- To test and debug code written in python.
- To perform file operations to read and write data in files.
- Apply the basic concepts and understand the various data structures available in Python programming language.
- Apply the functions in Python Programming to solve the problems.

List of References:

1. R. Nageswara Rao, “Core Python Programming I”, Dream tech Press
2. Y. Daniel Liang, “Introduction to Programming Using Python”, Pearson
3. Reema Thareja, “Python Programming: Using Problem Solving Approach”, Oxford University Press
4. Martin C Brown, “Python the Complete Reference”, Tata Mcgraw Hill, India
5. Ashok Kamthane and Amit Ashok Kamthane, “Programming and Problem Solving with Python”, Tata Mcgraw Hill, India.
6. John V Guttag. “Introduction to Computation and Programming Using Python”, Prentice Hall of India.

Open e-Resource:

1. <https://docs.python.org/3/tutorial/>
2. <https://www.coursera.org/>
3. <https://books.goalkicker.com/PythonBook>

List of Suggested Experiments:

1. Write a program to demonstrate different number data types in Python.
2. Write a program to perform different Arithmetic Operations on numbers in Python.
3. Write a python program to find largest of three numbers.
4. Write a program to create, append, and remove lists in python.
5. Write a program to demonstrate working with tuples in python.
6. Write a program to demonstrate working with dictionaries in python.
7. Write a Python program to convert temperatures to and from Celsius, Fahrenheit. [Formula: $c/5 = f-32/9$]
8. Write a python script to print the current date in the following format “Sun May 29 02:26:23 IST 2025”
9. Write a Python script that prints prime numbers less than 20.
10. Write a python program to find factorial of a number using Recursion.
11. Write a Python class to implement pow (x, n)
12. Write a Python class to reverse a string word by word.
13. Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order.
14. Write a python program to define a module and import a specific function in that module to another program.
15. Write a python program to define a module to find Fibonacci Numbers and import the module to another program

GANDHINAGAR INSTITUTE OF TECHNOLOGY
DIPLOMA 2nd SEMESTER
Civil Engineering / Mechanical Engineering

DOC NO: 4061

Subject Code: 101180202	Subject Title: Engineering Mechanics
Pre-requisite: Basic knowledge of Laws and Principles of Mathematics and Physics	

Course Objective:

- The primary purpose of the study of Engineering Mechanics is to develop the capacity to predict the effects of force while carrying out the creative design functions of engineering.
- The course addresses the modeling and analysis of static equilibrium problems with an emphasis on real world engineering applications and problem solving.
- It bridges the gap between physical theory and its application to 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	Basics of Mechanics: Significance and relevance of Mechanics, Applied mechanics, Statics, Dynamics. Space, time, mass, particle, flexible body and rigid body. Scalar and vector quantity, Units of measurement (SI units) - Fundamental units and derived units. Force – unit, representation as a vector and by Bow's notation, characteristics and effects of a Force. Principle of transmissibility of force, Principle of Superposition Force system and its classification.	4	10
2	Coplanar Concurrent Forces: Resolution of a force - Orthogonal components of a force Equilibrium and Equilibrant, Free body and Free body diagram, conditions of equilibrium, Resultant of forces using analytical and graphical methods for the forces acting at a point: Law of Parallelogram Law of triangle Law of Polygon Lami's Theorem – statement and explanation, Application for various engineering problems	10	22

3	Moment of Force and Parallel Forces Moment of a force, Varignon's Theorem, Couple, application, properties of couple, conditions of equilibrium. Resultant of force, Equilibrium forces and its position using analytical methods for the coplanar non - concurrent force system. Types of beam, supports (simple, hinged, roller and fixed) and loads acting on beam (vertical and inclined point load, uniformly distributed load, couple). Beam reaction for cantilever, simply supported beam with or without overhang – subjected to combination of Point load and uniformly distributed load. Beam reaction graphically for simply supported beam subjected to vertical point loads only.	10	22
4	Centroid & Centre of Gravity Concept of Centroid, Centre of Gravity. Axis of reference and Axis of Symmetry. Centroid of One-Dimensional geometrical figures using principle of moment. Centroid of Two-Dimensional geometrical Plane figures (Square, Rectangle, Triangle, Circle, Semi-circle, Quarter-circle) & Composite figures (not more than three figures) using first moment of area. Centre of Gravity of Simple solids (Cube, Cuboid, Cone, Cylinder, Sphere, Hemisphere) & Composite solids (not more than two solids) using first moment of mass.	06	13
5	Friction Friction, Types of Friction and laws of friction, limiting equilibrium, limiting friction. Coefficient of friction, angle of friction, angle of repose, relation between coefficient of friction and angle of friction. Equilibrium of bodies on level surface subjected to force parallel and inclined to plane. Equilibrium of bodies on inclined plane subjected to force parallel to the plane only.	06	13
6	Simple Lifting Machines Simple lifting machine, load, effort, mechanical advantage, applications and advantages. Velocity ratio, efficiency of machines. Application of law of machine. Ideal machine, friction in machine, maximum Mechanical advantage and efficiency. Reversible and non-reversible machines, conditions for reversibility. Velocity ratios of Simple wheel and axle, Differential axle and Wheel and, Worm and worm wheel, Single purchase and double purchase crab winch, Simple screw jack. Relevant problems on simple lifting machines.	09	20

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

- Apply basics of mechanics to identify the force systems and determine unknown force for coplanar concurrent force system.
- Apply principle of moment to analyses coplanar non-concurrent force system.
- Find the centroid and center of gravity of various components in engineering systems.
- Apply principle of friction to analyses static equilibrium of coplanar concurrent force system.
- Select relevant simple lifting machine(s) for given purpose.

List of References:

1. Title: Engineering Mechanics Author: R. S.Khurmi Publisher: S. Chand , New Delhi. (2019)
2. Title: Engineering Mechanics Author: D. S. Kumar Publisher: S. K. Kataria& Sons, New Delhi (2021 reprint)
3. Title: Engineering Mechanics 7th edition Author: Bear &Johnston Publisher: New media-McGraw Hill (India), Noida (1999)
4. Title: Applied Mechanics Author: Dr. H. J. Shah & S.B. Junnarkar Publisher: CHAROTAR Publication, Anand (2013)
5. Title: Engineering Mechanics Author: D.S. Bedi Publisher: Khanna Publications, New Delhi (2019)

Open e-Resource:

1. <https://youtube.com/playlist?list=PLD85An3RPybx5psW5HwPtUGH7AXtBjhLm> (Bisag Video Lectures by DTE, Gujarat)
2. https://youtube.com/playlist?list=PLyqSpOzTE6M_MEUdn1izTMB2yZgP1NLfs (NPTEL Video Lectures by IIT, Kanpur)
3. <https://nptel.ac.in/courses/122/104/122104015/> (NPTEL Video Lectures by IIT, Madras)
4. www.vlab.co.in
(Virtual Lab by Ministry of Education, Government of India)

List of Suggested Experiments:

1. Equilibrium of Coplanar Concurrent Forces
2. Equilibrium of Coplanar Non-Concurrent Forces
3. Determination of Reactions of Simply Supported Beam
4. Determination of angle of repose & Co-Efficient of Static Friction
5. Verification of principle of moment: Bell crank lever
6. Determination of Parameters of Machines

GANDHINAGAR INSTITUTE OF TECHNOLOGY
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Civil Engineering / Mechanical Engineering / Electrical Engineering / Electronics and Communication Engineering / Computer Engineering / Information Technology / Computer Science and Engineering / Artificial Intelligence and Machine Learning / Cyber Forensic and Information Security/ Information and Communication Technology

DOC NO: 4061

Subject Code: 101180201	Subject Title: Environment and Sustainability
Pre-requisite: Zeal to learn	

Course Objectives:

- To create environmental awareness among the students.
- To gain knowledge of different types of pollution in the environment.

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	70	30	00	00	100

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Ecology & Ecosystems (Structure and Function): Introduction to Ecology & Environmental Sciences; Principles and Scope, Ecosystems, Forest, Desert, Wetlands, River, Oceanic and Lake. Biodiversity: Types, Value; Hot spots; Threats and Conservation of biodiversity, Forest Wealth, and Deforestation.	4	20
2	Advances in Energy Systems (Merits, Demerits, Global Status and Applications): Hydrogen, Solar, OTEC, Tidal and Wind. Natural Resource Management (Concept and case-studies): Disaster Management, Sustainable Mining, case studies, and Carbon Trading.	4	20
3	Environmental Pollution (Sources, Impacts, Corrective and Preventive measures, Relevant Environmental Acts, Case-studies): Surface and Ground Water Pollution; Noise pollution; Soil Pollution and Air Pollution. Waste Management & Public Health Aspects: Bio-medical Wastes; Solid waste; Hazardous wastes; E-waste; Industrial and Municipal Sludge.	6	20
4	Global Environmental Concerns (Concept, policies and case-studies): Ground water depletion/recharging, Climate Change; Green House Effect; Global Warming; Acid Rain; Ozone Layer Depletion; Resettlement and rehabilitation of people, Environmental Toxicology.	6	20

5	Latest Developments in Environmental Pollution Mitigation Tools (Concept and Applications): G.I.S. & Remote Sensing, Environment Impact Assessment, Environmental Management Systems, ISO14001; Environmental Stewardship- NGOs. Field work: Visit to an Environmental Engineering Laboratory or Green Building or Water Treatment Plant or Wastewater treatment Plant.	8	20
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Course Outcome: After completion of this course, students will be able to

- Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale.
- Develop critical thinking and/or observation skills and apply them to the analysis of a problem or question related to the environment.
- Demonstrate ecology knowledge of a complex relationship between biotic and abiotic components.
- Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues.

List of References:

1. Environmental studies, Benny Joseph, Tata Mcgraw-Hill 2nd edition 2012
2. Environmental studies, S M Prakash, pristine publishing house, Mangalore 3rd edition-2018
3. Benny Joseph, Environmental studies, Tata Mcgraw-Hill 2nd edition 2009
4. M.Ayi Reddy Textbook of environmental science and Technology, BS publications 2007
5. Dr. B.S Chauhan, Environmental studies, University of science press 1st edition

Open e-Resource:

1. https://onlinecourses.nptel.ac.in/noc23_hs155/preview

Activities:

- Prepare and analyze a case study on any polluted city of India.
- Prepare a note based on the field visit to the solid waste management department of the municipal corporation / local authority.
- Record the biodiversity of your institute/garden in your city mentioning types of vegetation and their numbers.
- Visit any functional hall/cultural hall /community hall / College Canteen to study the disposal techniques of kitchen waste and prepare a report suggesting sustainable waste management tool.
- Watch a video related to air pollution in India and present the summary.

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Civil Engineering / Mechanical Engineering / Electrical Engineering / Electronics and Communication Engineering / Computer Engineering / Information Technology / Computer Science and Engineering / Artificial Intelligence and Machine Learning / Cyber Forensic and Information Security/ Information and Communication Technology

DOC NO: 4061

Subject Code: 100000203	Subject Title: Essence of Indian knowledge and Tradition
Pre-requisite: National education Policy 2020, has given ample emphasis on Indian Knowledge system. The significance of teaching of Indian knowledge and Tradition is very much required as for centuries this great tradition had been trampled under the feet of invaders. Even after Independence, Indian Knowledge System had been neglected and only Western parameters have been considered as standard. The essence of Indian culture has been carried through centuries only because of its scientific and humanitarian approach. It is the need of the hour that young students learn the significance of the contribution made by Indian Knowledge Systems and contribute to the world with pride and confidence even in the field of Science and technology which had been mastered centuries ago but was perished by invaders. This course will provide an opportunity to the students the hidden secrets of the great heritage of knowledge that existed thousands of years ago in Indian Tradition.	

Course Objective:

- Study of IKS will enable students to respect and relish the greatness of our tradition. The awareness of IKS will make them feel proud about their own culture.
- The knowledge of Indian knowledge will enable and empower them with the firsthand knowledge of India's great heritage, culture and traditions.
- This will create a scope and awareness amongst the foreigners regarding India and its contribution to the world.

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	70	30	00	00	100

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Ancient Indian Astronomy: Development of Astronomy: • Consideration of Purnima and Amavasya • Beginning of The New Year- Vasant Ritu- (Vernal Equinox) • Ancient Indian Calender • Science Behind "Adhikmaas" • Uttarayan and Dakshinaya	5	19

2	Knowledge about Constellations / planets / distance between planets etc.: - Saptarushi – seven Seers- Significant Knowledge of star and constellations - Knowledge of Speed of Light – Rigveda (1.50.04) - Distance between Earth and Sun (Hanuman Chalisa)	5	19
3	Advances in Mathematics and Geometry in Ancient India: A) Sulbha- Sutra (Kalpa Sutra) composed by Baudhayana, Manava, Apastamba and Katyayana B) Contribution of Ancient Rishis to Mathematics - Baudhayana's value of pie - Lilavati - Bhaskaracharya - Arya Bhatt.	6	21
4	Town Planning in Ancient India: - Roads in Ancient India – Uttarpath by Chandra Gupta - Ancient Indian Trade Routes/ Waterways - Ship- Building in Ancient India - Temple Architecture (Nagar Style/ Dravida style/ Vesara style)	4	14
5	Atomic Theory of Kanada: - Concept of Seven Padartha and Nine Dravyas - Theory of Gurutva - Characteristics of Atom	3	10
6	Metallurgical Discoveries in Ancient India: - Lime a Mortar - Bronze - Gold & Silver - Glass / Iron - Nagarjuna's Contribution in making Alloys	2	7
7	Vimanshastra - Airbourne Vehicles: - References of Vimana- Flying Machines in Rigveda, Mahabharat and Ramayana - BhardwajSutra- Chapter-1 Rasyagnoadhikari	3	10

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

- Students will attain awareness regarding the significance of IKS.
- The syllabus will enhance their confidence in Indian traditional knowledge system and enable them to perceive at the problems with Indian perspective.
- This will also enable them to analyze the issues on their own and enable them for critical thinking.
- The knowledge about the ancient Indian Scientific traditions will generate more confidence in themselves.
- This will lead them to make research and innovative thinking which can result in global contribution at later stage.

*Revised Bloom's Taxonomy (RBT)

List of References:

1. History of Science, Arts & Technology By Dr. Shripad Dattatrya Kulkarni, Bhishma Prakashan, Mumbai -1998.
2. Introduction to Indian Knowledge System: Concepts and Applications by B. Mahadevan, Vinayak Rajat Bhat, Nagendra Pavana, PHI Learning Pvt. Ltd., Delhi
3. Town Planning in Ancient India by Binode Bihari Dutt, Thacker, Spink & Co.
4. ભારતનો વૈજ્ઞાનિક વારસો લેખક- J.J Raval University

Open e-Resource:

- <https://nptel.ac.in/courses/101104065>
- <http://nptel.ac.in/courses/121106003>

List of Suggested Practical / Project:

- The student can visit any historical / monumental sights like Adalaj step well or Rani Ki Vav – Patan and study about architectural skills of Indians in past.

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Civil Engineering / Mechanical Engineering / Electrical Engineering / Electronics and Communication Engineering / Computer Engineering / Information Technology / Computer Science and Engineering / Artificial Intelligence and Machine Learning / Cyber Forensic and Information Security/ Information and Communication Technology

DOC NO: 4061

Subject Code: 100000202	Subject Title: Indian Constitution
Pre-requisite: Zeal to learn	

Course Objective:

- Enrich the knowledge of the Indian Constitution.
- Fundamental Concepts of the Indian Constitution.

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	0	-	-	-	50	50

Subject Contents				
Sr. No	Topic	Total Hours	Weight (%)	
1	Meaning of Constitution Law and Constitutionalism Constitutional Law, Constitutionalism Historical Perspective of the Constitution of India History of Constitution of India, Indian Constitution, Elements of Constitution of India Features and Characteristics of the Constitution of India Features of Constitution of India, Characteristics of Constitution of India	4	13	
2	Fundamental Rights Introduction, Right to Equality (Article 14-18), Right to Freedom (Article 19-22), Right Against Exploitation (Article 23 & 24), Right to Freedom of Religion (Article 25-28), Cultural and Educational Rights (Article 29-30), Right to Constitutional Remedies (Article 32), Right to Privacy, Features of Fundamental Rights Right to Equality under Article – 14 to 18 Right to Equality, Equality Rights (Article 14-18): Article 14 – Equality before Law, Article 15 – Prohibition of Discrimination on the Grounds of Religion, Race, Caste,			

	Sex of Place of Birth, Article 16 – Equality of Opportunities in Matters of Public Employment, Article 17 – Abolition of Untouchability, Article 18 – Abolition of titles Right to certain freedom under Article – 19 to 22 Article 19 – Protection of Certain Rights Regarding Freedom of Speech, Freedom Rights (Article 19-22) Scope of the right to life and personal liberty under Article 21 Scope of Right to life and Personal Liberty – Article 21, Meaning and Concept of ‘Right to Life’	8	26
3	Fundamental Duties and its Legal Status Nature of Fundamental Duties, The Relationship between the Fundamental Rights, Directive Principles and Fundamental Duties, Legal Status The Directive Principles of State Policy Directive Principles of State Policy, Classification of Directive Principles of State Policy (DPSP), Features of Directive Principles of State Policy, New Provisions of Directive Principles after Amendment	4	14
4	Federal structure and distribution of legislative and financial powers between the Union and the States Federal System – Features of Federal Government, Legislative Relations (Article 245-255) – Centre’s Control Over State Legislation, Financial Relations (Article 268-293)	2	7
5	Parliamentary form of Government in India – The constitution powers and status of the President of India Parliamentary System: Rajya Sabha, Lok Sabha, Article 74 – Council of Ministers to Aid and Advise President, Article 75 – Other Provisions as to Ministers, Merits and Demerits of Parliamentary System: Merits of Parliamentary System, Demerits of Parliamentary System, Status of President,	3	10
6	Amendments of the Constitutional Powers and Procedure Constitutional Amendment: Ways of Constitution Amendment, Article 368 – Power of Parliament to Amend the Constitution and Procedure, Procedure for Amendment The Historical Perspective of the Constitutional Amendments in India Important Amendments of the Indian Constitution	3	10
7	Emergency Provisions: National Emergency, President Rule, Financial Emergency Emergency Provisions: Types of Emergencies, Meaning of Emergency, History of Emergency in India, Reasons for Incorporating Emergency Provisions, National Emergency – Article 352: Sub-Types of National Emergency, Effects on Fundamental Rights in National Emergency, Code of Conduct for Press in Emergency – 1971, State Emergency – Article 356: Difference between National Emergency and President’s Rule, Financial Emergency – Article 360: Effects of Financial Emergency	3	10

8	Local Self Government – Constitutional Scheme in India Local Self Government: Role of Local Government, Constitution (73rd Amendment) Act 1992: Panchayat, Gram Sabha, Village Level Panchayat, Intermediate Level Panchayat, District Level Panchayat, Social Auditing, Constitution (74th Amendment) Act – 1992	3	10
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Course Outcome: After completion of this course, student will be able to

- Enhance human values, create awareness about law enactment and importance of the Constitution.
- To observe the fundamental rights and fundamental duties of the Indian citizen to instill morality, social values, honesty, dignity of life and their social responsibilities.
- Create awareness of their surroundings, society, social problems, and their suitable solutions while keeping rights and duties of the citizens keeping in mind.
- Comprehend distribution of powers and functions of local self-Government.
- Envisage the national emergency, financial emergency, and their impact on the economy of the country.

List of References:

1. Constitutional law of India, Dr. J N Pandey, Central Law Agency.
2. Introduction to the Constitution of India, Durga Das Basu, LexisNexis.
3. Indian Constitutional Law, M P Jain, LexisNexis.
4. V N Shukla's Constitution of India, Mahendra Pal Singh, Eastern Book Company.
5. Constitutional Law – I Structure, Udai Raj Rai, Eastern Book Company.

Open e-Resource:

1. https://onlinecourses.nptel.ac.in/noc23_lw03/preview

GANDHINAGAR INSTITUTE OF TECHNOLOGY

DIPLOMA 2nd SEMESTER

Civil Engineering / Mechanical Engineering / Electrical Engineering / Electronics and Communication Engineering / Computer Engineering / Information Technology / Computer Science and Engineering / Artificial Intelligence and Machine Learning / Cyber Forensic and Information Security/ Information and Communication Technology

DOC NO: 4061

Subject Code: 100000201	Subject Title: Applied Mathematics
Pre-requisite: Trigonometry, Geometry and Calculus and Basics of Algebra	

Course Objective:

- (1) This course is designed to give comprehensive coverage at an introductory level to the subject of geometry, Algebra, differential and integral calculus.
- (2) In this course students can understand the advanced concepts and applications based on calculus, Differential equations understand and solve engineering problems.

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	Co-Ordinate Geometry: Equation of straight line in various standard forms (without proof), inter section of two straight lines, angle between two lines. Parallel and perpendicular lines, perpendicular distance formula. General equation of a circle and its characteristics. To find the equation of a circle, given: Centre and radius, three points lying on it and Coordinates of end points of a diameter; Definition of conics (Parabola, Ellipse, Hyperbola), their standard equations without proof. Problems on conics when their foci, directrices or vertices are given.	10	25
2	Differential Calculus: Concept of limits, Continuity and Derivatives, Differentiation of all basic functions: trigonometric, inverse trigonometric,	8	20

	Logarithmic and Exponential functions; Rule of differentiation: sum, product, composition and quotient of functions and simple examples based on it.		
3	Application of derivatives: Equation of tangent line and normal, Maxima & Minima. Differential Equations: Definition, Order and Degree of Differential Equation, formation of DE; Solution of first order and first degree: By Variable Separable, Homogeneous and Integrating Factor methods (simple problems).	10	20
4	Integral Calculus: Concept, Integral of Standard Functions, Working Rules of Integration, Integration by Parts, Integration by Substitution Method, Definite Integral and its properties. Partial Fractions: Definition of partial fractions, proper & improper fractions and partial fraction with denominator containing non-repeated linear factors, repeated linear factors and irreducible non-repeated quadratic factors.	8	20
5	Applications of Integration: Simple problems on evaluation of area bounded by a curve and axes, area bounded by two intersecting curves, Calculation of Volume of a solid formed by revolution of an area about axes. (Simple problems).	6	15

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

1. To understand the coordinate geometry this provides a connection between algebra and geometry through graphs of lines and curves.
2. To understand the effects of changing conditions on a system and to understand rate of change.
3. To know the application of derivatives to analyze and interpret the solutions of physical problems by differential equations.
4. To study the cumulative effect of the original quantity or equation is the integration, one can perform the partial fraction decomposition that provides an algorithm for computing the antiderivative of a rational function.
5. To Apply integration for finding Area and Volume to solve real world applied problems.

List of Textbooks:

1. W R Neelkanth, Applied Mathematics-I, Sapna Publication.
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 40th Edition, 2007.
3. G. B. Thomas, R. L. Finney, Calculus and Analytic Geometry, Addison Wesley, 9th Edition, 1995.
4. Pandya N R Advanced Mathematics for Polytechnic, Macmillan Publishers India Ltd., 2012.

List of Reference Books:

1. Anthony croft and others, Engineering Mathematics (third edition), Pearson Education.
2. Reena Garg, Engineering Mathematics, Khanna Publishing House, New Delhi (Revised Ed. 2018).
3. V. Sundaram, R. Balasubramanian, K.A. Lakshminarayanan, Engineering Mathematics, 6/e, Vikas Publishing House.
4. Prakash D S, Polytechnic Mathematics S Chand, 1985.

Gandhinagar Institute of Technology
Diploma Computer Engineering /Computer Science & Engineering /Information Technology
Semester 3

Subject Code: 101240302	Subject Title: Basic Object-Oriented Programming
Pre-requisite:	

Course Objective:

1. Understand fundamental OOP concepts.
2. Implement classes, objects, inheritance, and polymorphism.
3. Apply encapsulation principles for data abstraction.
4. Utilize pointers, dynamic memory allocation, and exception handling.
5. Develop simple applications, demonstrating proficiency in problem-solving and algorithmic thinking.

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	4	70	30	30	20	150

Subject Contents				
Sr. No	Topic	Total Hours	Weight (%)	
1	Overview of Object Oriented Programming: Introduction to Object Oriented Programming, Procedure Oriented and Object Oriented, Difference Between C and C++, C++ Output/ Input, Keywords in C++, New style of header file specification, Comments in C++, Variables in C++, Reference Variables in C++, The Data type, Importance of function prototyping in C++, Function Overloading, Default Arguments, Inline Function, Scope Resolution Operator Classes And Object,	4	7	
2	Structures in C++: Structures in C, Structure in C++, Access Specifier, Classes, Objects in C++, Characteristics of Access Specifier, Function outside a class, Initialization of variable in C++, 'this' pointer.	4	7	
3	More on Classes and Objects: Member Functions and Data Members, Friend Functions, Friend Class, Array of Class Object, Passing Class Objects to Function, Returning Objects from Functions, Nested Classes, Namespaces Dynamic Memory Management, Introduction, Dynamic Memory Allocation Using "new", Dynamic Memory Deallocation, "Set_New_Handler" Function	7	13	

	Constructor and Destructor, Constructor-Characteristics of Constructor, Types of Constructors, Destructor - Characteristics of Destructor.		
4	Inheritance: Introduction, Advantages of Inheritance, 'Protected' Access specifier, Inheritance using different access specifier, Initialization of Base class members through derived class object, Different forms of Inheritance, Function Overriding. Virtual Functions and Inheritance – Introduction, Pointers to derived class, Rules for virtual function, Internals of Virtual Functions, Pure virtual function, Virtual Base class, Virtual destructor, Abstract class, Limitations of virtual Function, Early binding v/s Late binding.	10	15
5	Operator Overloading: Introduction, Operators that can be overloaded, Overloading Unary Operator using member Functions, Overloading Unary Operator using friend Functions, Overloading Binary Operator using member Functions, Overloading Binary Operator using friend Functions, Why to Overload Operators using friend function?, Rules for Operator Overloading Constructor- Destructor Invocation – Introduction, Order of Invocation of Constructors and destructors, Destructors in Action, Type Conversions.	9	16
6	Exception Handling: Introduction to Exception Handling, Exception Handling Mechanism, Try- catch block, Throwing in One function and catching in the other, single try block and multiple catch blocks, catching all the exceptions in a Single Catch Block, Finally Block, Re-throwing an Exception, Creating our own Exception	8	12

Course Outcome:

1. Understand fundamental OOP concepts.
2. Implement classes, objects, inheritance, and polymorphism.
3. Apply encapsulation principles for data abstraction.
4. Utilize pointers, dynamic memory allocation, and exception handling.
5. Develop simple applications, demonstrating proficiency in problem-solving and algorithmic thinking.

List of Textbooks:

1. K U Subhash, Object Oriented Programming with C++, Pearson

List of Reference Books:

1. Somashekara M.T., Programming in C++, PHI.
2. Kamthame Ashok N., Programming in C++, 2nd Edition, Pearson.
3. Balaguruswamy E, Object Oriented Programming in C++, TMH

Open e-Resource:

1. <https://www.programiz.com/cpp-programming>
2. https://onlinecourses.nptel.ac.in/noc19_cs38/preview
3. <https://www.codecademy.com/learn/learn-c-plus-plus>
4. <https://www.udacity.com/course/c-for-programmers--ud210>
5. <https://www.edx.org/learn/c-programming/codio-c-programming-basic-skills>

List of Suggested Experiments:

1. Create your account on github and save simple C++ program in github.

2. Develop minimum 5 programs using cin and cout.
3. Develop programs using scope resolution operator, simple manipulators, and enumeration.
4. Develop programs using call by reference and return by reference, default arguments, constant arguments, inline and function overloading.
5. Develop programs using structures.
6. Define minimum 5 different classes such as student, distance, shape, employee, account,
7. inventory, vector, movie-ticket booking, time, point, etc. with data member & member
8. functions. Also Develop programs to test those classes functionality.
9. Develop Programs using array of objects and static member function
10. Develop programs to pass object as an argument and Returning object.
11. Develop programs using friend function and Friend class.
12. Apply the concepts of constructors and destructors in the Programs developed in unit-2 and test those programs.
0. Develop programs using single, multilevel, multiple Inheritance.
0. Develop programs using Constructors in base and derive classes.
0. Develop a program to show use of this pointer.
0. Develop a program using runtime polymorphism.
0. Develop at least 2 programs using file operations.

Gandhinagar Institute of Technology
Diploma AIML
Semester 3

Subject Code: 101260302	Subject Title: Computer System Organization
Prerequisite: Knowledge of Basic Electronics and Microprocessor	

Course Objective:

1. Describe the organization of a computer system in terms of its main components.
2. Discuss the basic concepts and structure of computers.
3. Identify various parts of a system memory hierarchy.
4. Understand concepts of register transfer logic and arithmetic operations.
5. Learn the different types of data transfer modes and techniques

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	4	70	30	30	20	150

Subject Contents				
Sr. No	Topic	Total Hours	Weight (%)	
1	Computer Architecture & Register-Transfer and Micro-operations include Register - Transfer-Language, Register Transfer, Bus Transfer and Memory Transfer, Arithmetic Micro-Operations- Addition, Subtraction, Complements, Negation, Increment and Decrement.	10	24	
2	Basic Computer Organization includes Instruction codes, Computer Registers-AC or Accumulator, Data Register or DR, the AR or Address Register, program Reference counter (PC), Memory Data Register (MDR), Index register, Memory Buffer Register, Instruction Cycle, Memory Instructions, Input-Output and Interrupt, Addressing Modes.	12	28	
3	Input/output Organization includes Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer- Strobe Control and Handshaking, Modes of Data Transfer, Direct Memory Access (DMA), Input-Output Processor (IOP), CPU-IOP Communication.	07	17	
4	Memory Organization includes Memory Hierarchy, Memory Classification, Main Memory (RAM), Types of ROM, Auxiliary Memory, Cache Memory, Virtual Memory.	05	12	
5	Control Unit and Instruction Execution includes Control Unit: Function and Types (Hardwired and Microprogrammed), Instruction Format and Types, Instruction Cycle and Execution Phases (Fetch, Decode, Execute), Micro-operations in Instruction Execution, Control Word and Control Sequence, Hardwired Control: Design and Working, Microprogrammed Control: Control Memory and Sequencing, Comparison of Hardwired and Microprogrammed Control.	08	19	

Course Outcome:

1. Understand the basic concepts of computer architecture, register transfer, and micro-operations.
2. Explain the functional organization of a basic computer system including instruction codes, memory, and registers.
3. Describe input/output organization and data transfer mechanisms including DMA and interrupt handling.
4. Illustrate different types of memory and their hierarchical organization within a computer system.
5. Analyze the functioning of the control unit and differentiate between hardwired and microprogrammed control methods.

List of Textbooks:

1. Computer System Architecture by M. Morris Mano (Pearson Education India).
2. Computer Architecture and Organization by John P. Hayes – McGraw Hill

List of Reference Books:

1. Computer Architecture and Organization by Ghoshal, Subrata (Pearson Education India)
2. Fundamentals of Computer Organization and Architecture by Mostafa Abd-El-Barr and Hesham El-Rewini – Wiley
3. Computer Organization and Architecture by William Stallings – Pearson Education

List of Suggested Experiments:

10-12 experiments based on the syllabus covered as above will be performed and evaluated on a continuous basis.

Gandhinagar Institute of Technology
Diploma Computer Engineering /Computer Science & Engineering /Information Technology
Semester 3

Subject Code: 101190302	Subject Title: Introduction of Data Structures
Pre-requisite:	

Course Objective:

1. Differentiate primitive and non-primitive data
2. Implement programs to represent array in row major and column major order Develop programs using text files
3. Design and Implement search algorithms
4. Implement different operations on a Queue
5. Define the basic terms of a tree data structure
6. Implement basic operations on a binary tree

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	4	70	30	30	20	150

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Basic Concepts of Data Structures: Data Structure Basic Concepts, Types of data structures, Primitive and non-primitive data structures, Introduction to Algorithms, Key features of an algorithm Analysis Terms (for the definitions purpose only): Time Complexity, Space Complexity Asymptotic Notations: Big Oh Notation, Big Omega Notation, Big Theta Notation, Best case Time Complexity, Average case Time Complexity, Worst case Time Complexity,	6	10
2	Stack and Queues: Linear and Non-Linear Data Structures, Stack : Array representation of Stack, PUSH- POP Operations on Stack, Implementation of Stack, Application of Stack, Infix, Prefix and Postfix Forms of Expressions, Recursive Functions (Factorial, greatest common divisor, Fibonacci series) , Queue: Array representation of Queue Operations on a Queue (Add an element, delete an element, display all elements of a queue), Implementation of a Queue, Limitation of a Single Queue, Concepts of Circular Queue, Applications of a queue, Differentiate circular queue and simple queue	10	18

3	Linked List: Pointers Revision, Revision of Structure, Revision of structure using pointers ,Dynamic Memory Allocation, Linked list Presentation ,Types of Linked List, Basic operations on singly linked list : Insertion of a new node in the beginning of the list, at the end of the list, after a given node, before a given node, in sorted linked list, Deleting the first and last node from a linked list, Searching a node in Linked List, Count the number of nodes in linked list, Concepts of circular linked list,Difference between circular linked list and singly linked list,Doubly linked list: Representation, Difference between Doubly linked list and singly linked list ,Applications of the linked list	9	14
4	Trees: Non-linear data structures: Tree, Graph, Basic Terms: General Tree, Forest, Binary trees, level number, degree, in-degree and out-degree,root node, leaf node, directed edge, path, depth Binary tree: Complete Binary Tree, Strict Binary Tree, Conversion of General Tree to Binary Tree,Binary Search Tree : Insertion of a node in binary tree, Deletion of a node in binary tree, Searching a node in binary tree ,Binary Tree Traversal : Inorder, Preorder, Postorder ,Applications of binary tree	7	14
5	Sorting and Hashing : Sorting Methods : Bubble Sort,Selection Sort, Quick Sort, Insertion Sort,Merge Sort,Radix Sort ,Hashing Concepts Hash functions: Division Method, Middle Square Method, Folding Method	10	14

Course Outcome:

1. Perform basic operations on arrays and strings.
2. Demonstrate algorithms to insert and delete elements from the stack and queue data structure.
3. Apply basic operations on the linked list data structure.
4. Illustrate algorithms to insert, delete and search a node in tree.
5. Apply different sorting and searching algorithms to the small data sets.

List of Textbooks:

1. An Introduction to Data Structures with Applications by Jean-Paul Tremblay & Paul G. Sorenson Tata McGraw Hill

List of Reference Books:

1. Data and File Structures using C Thareja,Reema Oxford University Press New
2. Data Structures Chitra, A Rajan, P T Tata McGraw Hill, New delhi,
3. Data Structures using C & C++ Tenen Baum Prentice-Hall International
4. Classic Data Structures Samanta, D. PHI Learning, New Delhi

Open e-Resource:

1. <https://www.programiz.com/dsa>
2. <https://nptel.ac.in/courses/106102064> (Introduction to data structures and algorithms, IIT Delhi)
3. <https://nptel.ac.in/courses/106106133> (Programming, Data structures and Algorithms, IIT Madras)
4. <https://www.codecademy.com/learn/linear-data-structures>
5. <https://www.udacity.com/course/data-structures-and-algorithms-in-python--ud513>
6. <https://www.edx.org/learn/data-structures>

List of Suggested Experiments:

1. Define various terms such as algorithm, various approaches to design an algorithm, time complexity, space complexity, best case, average case and worst-case time complexity etc.
2. Implement array using row major order and column major order
3. Implement Sequential search algorithms.
4. Implement Binary search algorithms.
5. Implement various string algorithms.
6. Implement push and pop algorithms of stack using array
7. Implement recursive functions.
8. Implement insert algorithms of queue using array.
9. Implement delete algorithms of queue using array.
10. Implement simple structure programs using pointers.
11. Implement insertion of node in the beginning of the list in singly linked list.
12. Implement insertion of node at the end of list in singly linked list.
13. Implement insertion of node in sorted linked list.
14. Implement insertion of node at any position in linked list.

Gandhinagar Institute of Technology
Diploma AIML/ EC
Semester 3

Subject Code: 101260303	Subject Title: Artificial Intelligence
Prerequisite: Basic knowledge of programming concepts and problem-solving techniques using languages like Python or C.	

Course Objective:

1. Understand the basic principles and goals of Artificial Intelligence.
2. Learn problem-solving methods using search techniques and state-space representation.
3. Explore different approaches to knowledge representation and logical reasoning.
4. Familiarize themselves with Natural Language Processing fundamentals.
5. Understand the basics of Neural Networks and their application areas.

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	4	70	30	30	20	150

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Introduction to Artificial Intelligence What is AI, examples of AI in real life, how AI works, and the basic types of AI problems and techniques. Introduction to models used in AI.	05	12
2	Problem Solving Using Search Techniques Understanding how AI solves problems using simple steps (State Space). Concepts of search methods like trial-and-error (Generate & Test), Hill Climbing, and Best-First Search. Real-life examples like puzzles or route finding. Introduction to how problems can be reduced and solved with constraints.	10	24
3	Knowledge Representation How AI stores and uses knowledge. Simple ways to represent facts using logic. Understanding relationships, decision making with rules, and how computers “think” with logic. Basic idea of reasoning forward (from known facts) and backward (from goals).	08	20
4	Basics of Natural Language Processing (NLP) How computers understand human languages like English. Introduction to understanding sentences (syntax), word meaning (semantics), and grammar. Real-life examples like translation and voice assistants. Basic spell checking.	07	17
5	Neural Networks (Connectionist Models) Introduction to how machines learn like the human brain using simple networks. Basic concept of how neural networks work, learning using examples, and where they are used (face recognition, recommendations). Very simple explanation	12	27

	of terms like learning, layers, and examples of AI in everyday applications.		
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Course Outcome:

1. Explain the fundamentals and scope of AI.
2. Apply search algorithms to solve simple AI problems.
3. Represent knowledge using logical structures and perform basic reasoning.
4. Demonstrate understanding of simple NLP concepts and use cases.
5. Describe neural networks and how machines can “learn” from data.

List of Textbooks:

1. Elaine Rich, Kevin Knight – Artificial Intelligence (Tata McGraw Hill).
2. Stuart Russell and Peter Norvig – Artificial Intelligence: A Modern Approach (Pearson)

List of Reference Books:

1. Dan W. Patterson – Introduction to Artificial Intelligence and Expert Systems
2. E. Charniak and D. McDermott – Introduction to Artificial Intelligence.
3. Parag Kulkarni – Artificial Intelligence – Building Intelligent Systems (PHI Learning).

List of Suggested Experiments:

10-12 experiments based on the syllabus covered as above will be performed and evaluated on a continuous basis.

Gandhinagar Institute of Technology
Diploma AIML
Semester 3

Subject Code: 101260304	Subject Title: Foundations of Computing
Prerequisite: Basic math skills and simple programming concepts (like loops and conditions).	

Course Objective:

1. To help students learn how computers use logic to make decisions.
2. To teach basic concepts of sets, graphs, and functions.
3. To understand patterns and how to prove them.
4. To learn how computers work with numbers and perform calculations.
5. To introduce simple models of how computers solve problems.

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	0	0	100

Subject Contents				
Sr. No	Topic	Total Hours	Weight (%)	
1	Logic and Reasoning: Basics of logic used in computing. True/false statements, logic gates, and circuits. How to write and understand simple logical statements. Introduction to truth tables, logical operations (AND, OR, NOT), and basic rules of logic. Simple ways to prove things using direct proof, examples, and contradiction.	08	20	
2	Sets, Functions, and Relations: Understanding groups of items (sets), how items relate to each other (relations), and how inputs link to outputs (functions). Includes Venn diagrams, set operations, and examples like student-class assignments. Also covers graphs like networks and family trees in simple form.	06	15	
3	Induction and Recursion: Learning how to prove formulas and solve problems step by step using patterns. Covers basic induction, strong induction, and how to use it to prove correctness of small programs. Simple examples include number patterns, tree shapes, and loops in programs.	08	20	
4	Number Systems and Arithmetic: Working with binary numbers, number conversion between decimal and binary, simple operations like addition and multiplication using binary numbers. Concepts of prime numbers, GCD (greatest common divisor), and how these are used in security like passwords (RSA basics).	08	20	
5	Machines and Computation: How computers "understand" patterns. Learn about simple machines like DFA (Deterministic Finite Automata), how they are used to check inputs (like passwords), and	12	25	

	basic idea of what computers can and cannot solve. Covers pattern matching and the Halting Problem in a simplified way.		
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Course Outcome:

1. Understand and use basic logic in computing.
2. Work with sets, functions, and relations in computer science.
3. Use induction to solve and prove problems.
4. Perform operations with binary numbers and understand their applications.
5. Understand how simple machines work and what problems computers can solve.

List of Textbooks:

1. Kenneth H. Rosen – Discrete Mathematics and Its Applications.
2. Susanna S. Epp – Discrete Mathematics with Applications

List of Reference Books:

1. Sipser, Michael – Introduction to the Theory of Computation (simplified chapters only)
2. David Gries & Fred Schneider – A Logical Approach to Discrete Math.
3. N. J. Cutland – Computability: An Introduction to Recursive Function Theory.
4. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman – Automata Theory, Languages, and Computation

Gandhinagar Institute of Technology
Diploma All Engineering Branch
Semester 3

Subject Code: 100000301	Subject Title: Universal Human Values
Pre-requisite :- Zeal to learn the subject	

Course Objective:

1. To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

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	-	50	-	-	50

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1.	Course Introduction - Need, Basic Guidelines, Content and Process for Value Education: Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration-what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels	9	20

2.	Understanding Harmony in the Human Being - Harmony in Myself!: Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya - Practice Exercises and Case Studies will be taken up in Practice Sessions.	8	17
3.	Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship: Understanding Harmony in the family – the basic unit of human interaction, Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding the meaning of Vishwas; Difference between intention and competence, Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha)- from family to world family! - Practice Exercises and Case Studies will be taken up in Practice Sessions.	11	25
4.	Understanding Harmony in the Nature and Existence - Whole existence as Co-existence: Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence - Practice Exercises and Case Studies will be taken up in Practice Sessions.	7	15
5.	Implications of the above Holistic Understanding of Harmony on Professional Ethics: Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics: (a) Ability to utilize the professional competence for augmenting universal human order, (b) Ability to identify the scope and characteristics of people-friendly and ecofriendly production systems, (c) Ability to identify and develop appropriate technologies and management patterns for above production systems, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: (a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers, (b) At the level of society: as mutually enriching institutions and organizations	10	23

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

1. Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society.
2. Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.
3. Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society.
4. Understand the harmony in nature and existence and work out their mutually fulfilling participation in the nature.
5. Distinguish between ethical and unethical practices and start working out the strategy to actualize a harmonious environment wherever they work.

List of References:

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA.
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991.
4. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
5. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
6. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
7. A N Tripathy, 2003, Human Values, New Age International Publishers.
8. SubhasPalekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) KrishiTantraShodh, Amravati.
9. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers , Oxford University Press.
10. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
11. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
12. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

Open e-Resource:

1. Value Education websites, <http://uhv.ac.in>, <http://www.uptu.ac.in>
2. Story of Stuff, <http://www.storyofstuff.com>
3. Al Gore, An Inconvenient Truth, Paramount Classics, USA
4. Charlie Chaplin, Modern Times, United Artists, USA
5. IIT Delhi, Modern Technology – the Untold Story
6. Gandhi A., Right Here Right Now, Cyclewala Productions

List of Suggested Tutorial:

1. Introduce yourself in detail. What are the goals in your life? How do you set your goals in your life? How do you differentiate between right and wrong? What have been your achievements and shortcomings in your life? Observe and analyze them.
2. Now-a-days, there is a lot of voice about many techno-genic maladies such as energy and natural resource depletion, environmental pollution, global warming, ozone depletion, deforestation, soil degradation, etc. – all these seem to be man-made problems threatening the survival of life on Earth – What is the root cause of these maladies & what is the way out in your opinion? On the other hand, there is rapidly growing danger because of nuclear proliferation, arms race, terrorism, criminalization of politics, large scale corruption, scams, breakdown of relationships, generation gap, depression & suicidal attempts, etc. – what do you think, is the root cause of these threats to human happiness and peace – what could be the way out in your opinion?
3. Observe that each one of us has Natural Acceptance, based on which one can verify right or not right for him. Verify this in case of What is Naturally Acceptable to you in a relationship- Feeling of respect or disrespect? What is Naturally Acceptable to you – to nurture or to exploit others? Is your living the same as your natural acceptance or different? Out of the three basic requirements for fulfillment of your aspirations- right understanding, relationship and physical facilities, observe how the problems in your family are related to each. Also observe how much time & effort you devote to each in your daily routine.
4. List down all your desires. Observe whether the desire is related to Self (I) or Body. If it appears to be related to both, see which part of it is related to Self (I) and which part is related to Body.
5. Observe that any physical facility you use follows the given sequence with time: Necessary & tasteful → unnecessary & tasteful → unnecessary & tasteless → intolerable. In contrast, observe that any feeling in you is either naturally acceptable or not acceptable at all. If naturally acceptable, you want it continuously and if not acceptable, you do not want it any moment! List down all your activities. Observe whether the activity is of 'I' or of Body or with the participation of both 'I' and Body. Observe the activities within 'I'. Identify the object of your attention for different moments (over a period of say 5 to 10 minutes) and draw a line diagram connecting these points. Try to observe the link between any two nodes.
6. Chalk out programs to ensure that you are responsible to your body- for the nurturing, protection and right utilization of the body. Find out the plants and shrubs growing in and around your campus. Find out their use for curing different diseases. Observe on how many occasions you are respecting your related ones (by doing the right evaluation) and on how many occasions you are disrespecting by way of under evaluation, over-evaluation or otherwise evaluation. Also observe whether your feeling of respect is based on treating the other as yourself or on differentiations based on body, physical facilities or beliefs.
7. Write a note in the form of story, poem, skit, essay, narration, dialogue to educate a child. Evaluate it in a group. Develop three chapters to introduce 'social science- its need, scope and content' in the primary education of children. List down units (things) around you. Classify them in four orders. Observe and explain the mutual fulfillment of each unit with other orders.
8. Make a chart for the whole existence. List down different courses of studies and relate them to different units or levels in existence. Choose any one subject being taught today. Evaluate it and suggest suitable modifications to make it appropriate and holistic.
9. Choose any two current problems of different kind in society and suggest how they can be solved on the basis of natural acceptance of human values. Suggest steps you will take in present conditions. Suggest ways in which you can use your knowledge of Technology/Engineering/ Management for universal human order, from your family to the world family. Suggest one format of humanistic constitution at the level of nation from your side.

10. The course is going to be over now. Evaluate your state before and after the course in terms of thought, behavior, work and realization. Do you have any plans to participate in the transition of society after graduating from the institute? Write a brief note on it.

**Gandhinagar Institute of
Technology
Diploma Artificial Intelligence and Machine Learning
Semester 4**

Subject Code:101260401	Subject Title: Fundamental of Machine Learning
Pre-requisite: Basic Programming Knowledge (preferably in python)	

Course Objective:

1. This course provides an introduction to the fundamental concepts, algorithms, and applications of machine learning.
2. Students will learn various supervised, unsupervised, and reinforcement learning techniques along with practical implementations using Python programming language and popular machine learning libraries.

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 Machine Learning: Definition & scope, Types of machine learning algorithm, Applications, Tools and Technology for Machine Learning.	2	10
2	Exploratory Data Analysis: Types of data in Machine Learning, Data preprocessing: Dimensionality reduction, Feature subset selection., Handling missing data and outliers	4	15
3	Modeling and Evaluation: Selecting a Model: Predictive/Descriptive, training a Model for supervised learning, model representation and interpretability, evaluating performance of a model, Improving performance of a model.	4	20
4	Supervised Learning: Classification and Regression: Supervised Learning, Classification Model, Learning steps, Classification algorithms, Regression: Linear regression, Least Square method.	6	15
5	Unsupervised Learning: Supervised vs. Unsupervised Learning, Applications, Clustering, Association rules	5	15

Course Outcome:

1. Understand the core principles and techniques of machine learning.
2. Implement and evaluate various machine learning algorithms.
3. Apply machine learning techniques to solve real-world problems.
4. Develop critical thinking skills for designing and optimizing machine learning models.

List of Textbooks:

1. "Python the Complete Reference" by Martin C. Brown
2. "Pattern Recognition and Machine Learning" by Christopher M. Bishop.
3. "Introduction to Machine Learning" by Ethem Alpaydin.

List of References:

1. Machine Learning: The art and Science of Algorithms that make sense of Data - Peter Flach
2. "A Hundred-page Machine Learning Book" by Andriya Burkov

Open e-Resource:

1. <https://www.coursera.org/specializations/machine-learning-introduction>
2. <https://www.youtube.com/playlist?list=PLAqhlrjkxbuWI23v9cThsA9GvCAUhRvKZ>

List of Suggested Experiments:

1. Exploratory Data Analysis:
 - a. Analyzing dataset statistics (mean, median, standard deviation etc.)
 - b. Visualizing data distribution using histogram, box plot etc.
2. Data preprocessing:
 - a. Feature scaling and normalization
 - b. Handling categorical variables (one-hot encoding, label encoding)
3. Supervised learning:
 - a. Regression:
 - i. Linear regression
 - ii. Polynomial regression
 - b. Classification:
 - i. Logistic regression
 - ii. Decision tree
 - iii. K-nearest neighbors
4. Unsupervised learning:
 - a. Clustering:
 - i. K-means clustering
 - b. Dimensionality reduction:
 - i. Principal Component Analysis

Gandhinagar Institute of Technology
Diploma Cyber Forensic and Information Security/ Artificial Intelligence and Machine Learning
Semester 4

Subject Code: 101270401	Subject Title: Computer Networking
Pre-requisite:	

Course Objective:

1. To familiarize students with the fundamental concepts of computer networks, including network architecture and layered models such as OSI and TCP/IP.
2. To develop a thorough understanding of data transmission techniques, networking protocols, addressing methods, routing, and switching concepts.
3. To enhance practical skills in network design, configuration, troubleshooting, and basic client-server communication using socket programming.
4. To enable students to evaluate the performance and efficiency of networking protocols and understand core network security principles.
5. To empower students to design and implement simple network-based applications using socket programming.

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 Computer Networks: Introduction to computer networks, including their definition and necessity; classification of computer networks based on scope and connection methods; line configuration and network topologies; overview of standardization organizations and networking protocols; applications and key features of various types of servers.	07	20
2	Reference Models for Network Communication: Study of the OSI model and the functions of each of its layers; overview of the TCP/IP model and the roles of its layers; and a comparative analysis of the OSI and TCP/IP models.	07	30
3	Transmission Media & Network devices: Types of Transmission Media, Guided Media, Un Guided Media, Network Devices, Difference between Layer 2 and Layer 3 Switches.	10	20

4	IP Protocol: Introduction to Internet Protocol with emphasis on IPv4 and IPv6, including their features, functioning, and a comparative study of IPv4 and IPv6.	09	20
5	Network Security Aspects: Security Basics, Threats to security, Firewalls.	09	10

Course Outcome:

1. Classify various types of networks base on their construction, usage and scope
2. Differentiate OSI and TCP/IP models
3. Select proper transmission media and devices based on network requirements.
4. Compare IPv4 and IPv6 addressing scheme
5. Identify various types of network security threats.

List of Textbooks:

1. Computer Networks, Andrew S Tannebaum & David J Wetherall, Pearson, 2012
2. Computer Networks, Bhushan Trivedi, OxfordUniversityPress,2013

List of Reference Books:

1. Fundamentals Data Communication & Networking, Forouzen, Tata Mc Graw Hill.
2. Data & Computer Communication, Williams Stallings, Prentice Hall of India.
3. Networks for Computer Scientists and Engineers, Youlu Zheng & Shakil Akhtar, Oxford University Press, 2012.

Open e-Resource:

1. http://vlabs.iitb.ac.in/vlabs-dev/labs_local/computer-networks/labs/explist.php
2. <https://www.javatpoint.com/computer-network-tutorial>
3. <https://www.geeksforgeeks.org/basics-computer-networking>
4. <https://nptel.ac.in/courses/106106091>
5. https://www.cisco.com/c/en_in/products/security/what-is-network-security.html
6. [Network Simulator Tool: GNS3v0.8.5, NetSimK](#)

List of Suggested Experiments:

1. Connect computer using given topology with wired media. Assume six devices are arranged, if in:
 - a) bus topology b) ring topology
 - c) star topology d) mesh topology
 sFind out number of cables(links), ports needed in each device and total number of ports needed in entire network for each of above stated topology.
 0. To study and understand the network layers of the OSI model.
 0. To prepare and test straight-through and crossover UTP cables.
 0. To study and examine various networking devices available in the department/institute, such as repeater, hub, switch, bridge, router, and gateway.
 0. Determine whether following IPv4 address are valid or invalid. If valid IPv4 address then find class, Network and Host ID of an IPv4 address. If invalid IPv4 address then write reason for the same.

a) 1.4.5.5	b) 75.45.301.14
c) 111.56.045.78	d) 192.226.12.11
e) 130.45.151.154	f) 11100010.23.14.67
g) 221.34.7.8.20	h) 240.230.220.89

 0. Subnet the IP address 216.21.5.0 into 30 hosts in each subnet.
 0. Study of firewall in providing network security.
 0. Run basic utilities and network commands: ipconfig, ping, tracert, netstat, pathping, route

0. Basic network setup in Cisco Packet Tracer / real hardware – Connect 2 or more PCs using a switch.

Gandhinagar Institute of Technology
Diploma Computer Engineering/ Computer Science & Engineering/ Information Technology
Semester 4

Subject Code: 101190401	Subject Title: Introduction to Software Engineering
Pre-requisite:	

Course Objective:

1. Understanding of fundamental principles, methodologies, and tools of software engineering.
2. Apply software development methodologies to solve practical problems.
3. Develop and document software systems using modern engineering tools.
4. Collaborate effectively in teams to deliver software projects.
5. Recognize the importance of ethics, sustainability, and quality in software development.

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	4	70	30	30	20	150

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Software Process Models: Defining software, Software Application Domain, Software Engineering – A layered Approach, Generic Process Model, Generic Framework Activity, Umbrella activity, Software Development Models, Agile Development Model, Types of widely used Agile Models.	10	18
2	Software Requirement Analysis and Design: Requirement Gathering and Analysis, Software Requirement Specification(SRS), Software Requirement Specification(SRS), Software Design, Cohesion & Coupling, Data Flow Diagram(DFD), Use case Diagram, Class Diagram, Sequence Diagram, Activity Diagram.	14	20
3	Software Project Estimation & Scheduling: Responsibility of software project Manager, Metrics for Size Estimation, Project Estimation Techniques using COCOMO model, Project Scheduling, Risk Management.	10	18
4	Software Coding and Testing: Coding standards and guidelines, Code review, Software Documentation, Testing Fundamentals, Functional Testing – Black box testing, Structural Testing – White box testing,	08	14

	Overview of Alpha & Beta Testing, Overview of Unit testing & Integration testing, Test Documentation.		
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Course Outcome:

1. Compare various software development process models.
2. Prepare software analysis and design using SRS, DFD and object oriented UML diagrams.
3. Prepare software development plan using project scheduling.
4. Prepare test-cases to test software functionalities.

List of Textbooks:

1. Software Engineering: A Practitioner's Approach, Roger S. Pressman, Tata McGraw Hill, 2010.

List of Reference Books:

1. Fundamentals of Software Engineering, Rajib Mall, PHI, 2018.
2. Object Oriented Modeling and design with UML, Michael R Blaha and James R Rumbaugh, Pearson Prentice Hall, 2009

Open e-Resource:

1. <https://www.javatpoint.com/>
2. <https://www.geeksforgeeks.org/>
3. <https://www.tutorialspoint.com/>
4. www.w3schools.com
5. <https://www.techtarget.com/searchsoftwarequality/definition/agile-software-development>

List of Suggested Experiments:

1. Describe various software development models with appropriate Diagram.
2. Write problem statement to define the project title with bounded scope of the project.
3. Select relevant process model to define activities and related tasks set for assigned project.
4. Gather application specific requirements- Requirement gathering.
5. Prepare broad SRS (software requirement software) for the above selected project.
6. Develop data designs using DFDs (data flow diagram) and E-R (entity- relationship) diagram.
7. Prepare use-cases and draw use case diagram.
8. Develop a class diagram for selected project.
9. Develop Sequence diagram for selected project.
10. Develop the activity diagram to represent flow from one activity to another for software development.
11. Evaluate size of the project using Function point metric for the assigned project.
12. Estimate cost of the project using COCOMO (Constructive Cost Model) / COCOMO II approach for the assigned project.
13. Use flow chart and Gantt charts to track progress of the assigned project. (Use Sprint burn down chart if agile model is selected).
Prepare various test case for selected projects.

Gandhinagar Institute of Technology
Diploma Artificial Intelligence and Machine Learning
Semester 4

Subject Code: 101260402	Subject Title: Programming Paradigms
Pre-requisite: fundamental programming concepts, and elementary knowledge of computer science.	

Course Objective:

1. To introduce different programming paradigms used in software development.
2. To develop strong foundational skills in the Imperative paradigm using C language.
3. To introduce the Logic Programming paradigm using Prolog.
4. To develop the ability to write programs in both C and Prolog.
5. To understand where and why different paradigms are used in computing and AI.

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 Programming Paradigms: What is a programming paradigm? Types of paradigms- Imperative, Object-Oriented, Functional Logic, Declarative vs Procedural programming, Why different paradigms are needed in CS & AI, Example problems in each paradigm	08	18
2	Imperative Paradigm: C Programming (Basics): Structure of a C program, Variables, constants, data types, Operators, Input/Output statements, Decision-making: if/else, switch, Looping: for, while, do-while, Concept of memory in imperative programming	10	20
3	C Programming : Arrays (1D & 2D) Strings, Functions (call by value/reference), Pointers & pointer arithmetic, Structures & unions File handling basics, Imperative paradigm implementation examples	10	22
4	Logic Programming Paradigm: Prolog (Basics):		

	Introduction to Logic Programming, Prolog environment & syntax, Facts, Rules, Queries, Clauses, atoms, variables, Unification & pattern matching Simple Prolog programs: Family relations, Basic arithmetic, Facts & rules representation	09	20
5	Prolog (Advanced Concepts): Recursion in Prolog, Backtracking, Cut operator (!), List operations, Searching (concept only: DFS, BFS), Applications of Prolog in AI, Comparative study: Imperative vs Logic paradigm	8	20

Course Outcome:

1. Understand different programming paradigms.
2. Write programs using the C language for imperative-style solutions.
3. Represent knowledge and solve problems using Prolog.
4. Compare how problems are solved differently in C vs Prolog.
5. Apply both paradigms in simple AI and computational problem-solving.

List of Textbooks:

1. Let Us C – Yashavant Kanetkar
2. Programming in Prolog, Clocksin & Mellish

List of Reference Books:

1. The C Programming Language, Kernighan & Ritchie
2. Prolog Programming for Artificial Intelligence, Ivan Bratko
3. Programming Paradigms, Peter Van Roy

Open e-Resource:

1. <https://onlinecourses.nptel.ac.in/noc25.cml/preview>
2. <https://www.coursera.org/specializations/deep-learning>
3. <https://www.youtube.com/c/DeepLearningAI>
4. <https://www.kaggle.com/learn/deep-learning>

List of Suggested Experiments:

1. Write basic C programs using input/output.
2. Programs using loops & conditionals.
3. Programs on arrays & strings.
4. Functions & recursion in C.
5. Pointer-based programs.
6. Structure-based programs.
7. File handling programs.
8. Creating facts & rules for knowledge representation.
9. Family relationship solver using Prolog.
10. Recursion in Prolog (factorial, list length).
11. List operations (member, append).
12. Prolog queries demonstrating backtracking.

Gandhinagar Institute of Technology
Diploma Artificial Intelligence and Machine Learning
Semester 4

Subject Code: 101260403	Subject Title: Statistics & Probability for AI
Pre-requisite: Basic mathematics, elementary probability, and fundamental programming knowledge (preferably Python).	

Course Objective:

1. To introduce different programming paradigms used in software development.
2. To develop strong foundational skills in the Imperative paradigm using C language.
3. To introduce the Logic Programming paradigm using Prolog.
4. To develop the ability to write programs in both C and Prolog.
5. To understand where and why different paradigms are used in computing and AI.

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	0	0	100

Subject Contents				
Sr. No	Topic	Total Hours	Weight (%)	
1	Introduction to Statistics: What is Data Science? Why Data Science is important, Simple real-world Meaning, scope and importance of statistics, Data types: qualitative, quantitative, Population & sample, Methods of data collection Frequency distribution	08	18	
2	Descriptive Statistics: Measures of Central Tendency: Mean, Median, Mode, Measures of Dispersion Range, Variance, Standard Deviation, Quartiles and Percentiles, Covariance & Correlation, Hands-on explanation using simple Python examples (theory only)	09	20	
3	Probability Concepts: Basic terminology: experiment, event, sample space, Types of events, Rules of probability, Conditional probability, Bayes' Theorem (intro level), Random variables	10	22	
4	Probability Distributions:	10	22	

	Discrete distributions: Bernoulli, Binomial, Poisson Continuous distribution: Normal distribution, Z-score, Probability density function basic, Applications of distributions in AI		
5	Statistical Methods for AI : Hypothesis Testing (concept only), p-value and confidence intervals, Types of Errors: Type I, Type II, Introduction to Linear Regression, Role of statistics in machine learning	8	18

Course Outcome:

1. Understand the basics of statistics and its application in AI.
2. Compute and interpret statistical measures.
3. Apply probability rules for solving problems.
4. Understand and use common probability distributions.
5. Explain the role of statistics in AI and ML models.

List of Textbooks:

1. Probability and Statistics for Computer Science, T. Soong
2. Statistics for Engineers, Navdeep Singh

List of Reference Books:

1. Practical Statistics for Data Scientists, Peter Bruce
2. Think Stats, Allen Downey
3. S.C. Gupta, Fundamentals of Statistics

Open e-Resource:

1. https://onlinecourses.nptel.ac.in/noc25_ma18/preview
2. <https://www.khanacademy.org/math/statistics-probability>
3. <https://www.coursera.org/learn/statistics-with-python>
4. <https://www.openintro.org/book/os/>

Gandhinagar Institute of Technology
Diploma Computer Engineering/ Computer Science & Engineering/ Information Technology
Semester 4

Subject Code: 101240404	Subject Title: Contributor Personality Development
Pre-requisite:	

Course Objective:

1. To develop self-awareness and a contributor mindset that emphasizes responsibility, ethical behavior, and purposeful action in personal and professional life.
2. To cultivate essential soft skills such as effective communication, teamwork, adaptability, and resilience for becoming a value-driven individual.
3. To instill a sense of ownership and initiative by encouraging students to take accountability for their actions and contribute positively to society and workplace.
4. To foster goal-oriented thinking and time management abilities that enable students to plan, prioritize, and achieve meaningful personal and professional objectives.
5. To apply contributor values through real-life projects that enhance leadership, problem-solving, and decision-making skills with a focus on social and environmental responsibility.

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	0	0	0	50	50

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Understanding the Contributor Mindset : Case studies of contributor personalities (e.g., Dr. A.P.J. Abdul Kalam, Mother Teresa), Situational examples: workplace, social service, education, Building Self-Awareness, SWOT analysis of personality, Identifying personal strengths, values, and beliefs, Emotional intelligence and self-assessment tools, Ethics and Integrity, Importance of ethics in personal and professional life, Decision-making with integrity, Real-life ethical dilemmas and resolutions	10	30
2	Developing Contributor Qualities : Responsibility and Ownership, Taking initiative and being accountable, From problem identifier to solution provider, Communication and Collaboration, Verbal and non-verbal communication, Teamwork and active listening, Goal	10	30

	Setting and Time Management, SMART goals, Prioritization matrix, Tools for time management and productivity, Resilience and Adaptability, Coping with change and setbacks, Growth mindset and lifelong learning attitude, Conflict resolution through collaboration		
3	Applying Contributor Personality in Real Life: Personal Vision and Purpose, Crafting a personal mission statement, Aligning career and life goals with contribution, Social and Environmental Contribution, Civic sense, community work, Sustainability and environmental responsibility, Professional Contribution, Ethics in the workplace, Leadership with empathy and vision, Case Studies of professionals making an impact, Project and Presentation, Group or individual projects on community/social contribution, Presentation of learnings and personal growth reflections, Peer review and self-assessment	10	40

Course Outcome:

1. Demonstrate self-awareness and a contributor mindset by identifying personal strengths, values, and ethical responsibilities.
2. Apply effective communication, teamwork, and problem-solving skills in academic, professional, and social settings.
3. Develop goal-oriented behavior and contribute meaningfully to society through responsible, resilient, and purposeful actions.

List of Textbooks:

1. The 7 Habits of Highly Effective People by Stephen R. Covey
2. You Can Win by Shiv Khera

List of Reference Books:

1. Wings of Fire by Dr. A.P.J. Abdul Kalam
2. Emotional Intelligence: Why It Can Matter More Than IQ by Daniel Goleman

Open e-Resource:

1. [NPTEL – "Human Values" \(IIT Kanpur\)](#)
2. [Coursera – "Emotional Intelligence" by UC Davis](#)
3. [TutorialsPoint – Corporate Social Responsibility \(CSR\)](#)

Gandhinagar Institute of Technology
Diploma Computer Engineering/ Computer Science & Engineering/ Information Technology
Semester 4

Subject Code: 101240406	Subject Title: Integrated Personality Development Course
Pre-requisite:	

Course Objective:

1. enable students to develop a constructive mindset toward challenges and failures by learning from the experiences of eminent personalities like Walt Disney, Abraham Lincoln, and Amitabh Bachchan.
2. To instill core human values and ethics as essential qualities for success across personal, academic, and professional domains, helping students become responsible citizens and dependable individuals.
3. To inspire students through real-life case studies of Indian legends such as Sachin Tendulkar and Ratan Tata, and encourage them to emulate such traits in everyday situations.
4. To nurture a sense of national identity and cultural pride by exploring India's ancient wisdom, heritage, and contributions to global civilization.
5. To empower students with practical life skills including self-discipline, digital responsibility, leadership, networking, and selfless service, for their holistic growth and future readiness.

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	0	0	0	0	50	50

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Facing Failures: This lecture enables students to revisit the way in which they approach challenges. Through the study of successful figures such as Disney, Lincoln and Bachchan, students will learn to face difficulties through a positive perspective, Failure is a student's daily source of fear, negativity, and depression. Students will be given the constructive skills to understand failure as formative learning experiences. The Need for Values: Students will learn about the need for values as part of their holistic development to become successful in their many roles - as ambitious students, reliable employees, caring family members, and considerate citizens	10	30

2	Learning from Legends: Students will learn from the inspirational lives of India's two legends, Sachin Tendulkar and Ratan Tata. They will implement these lessons through relatable case studies My India My Pride: India's ancient Rishis, scholars, and intellectuals have made tremendous contributions to the world, they developed an advanced, sophisticated culture and civilization which began thousands of years ago. Students will learn the importance of studying India's glorious past so that they could develop a strong passion and pride for our nation	10	30
3	Remaking Yourself: Students learn how self-improvement enables them to secure a bright future for themselves. They will learn 6 powerful thoughtprocesses that can develop their physical, intellectual, emotional, and spiritual quotients, Power of Habit, Handling Social Media Soft Skills: Networking & Leadership, Students are taught the means of building a professional network and developing a leadership attitude, Project Management Selfless Service: Seva, Students will learn that performing seva is beneficial to one's health, wellbeing, and happiness. It also benefits and inspires others.	10	40

Course Outcome:

1. To provide students with a holistic value-based education that will enable them to be successful in their academic, professional, and social lives.
2. To give the students the tools to develop effective habits, promote personal growth, and improve their wellbeing, stability, and productivity.
3. To allow students to establish a stronger connection with their family through critical thinking and devolvment of qualities such as unity, forgiveness, empathy, and effective communication.
4. To enhance awareness of India's glory and global values, and to create considerate citizens who strive for the betterment of their family, college, workforce, and nation.
5. To provide students with soft skills that complement their hard skills, making them more marketable when entering the workforce.

List of Textbooks:

1. Steve Jobs: The Exclusive Biography Paperback by Walter Isaacson,
2. The Wit and Wisdom of Ratan Tata by Ratan Tata
3. Seven Habits of Highly Effective Teens by Sean Covey, Simon & Schuster

List of Reference Books:

1. Predictably Irrational, Revised and Expanded Edition: The Hidden Forces That Shape Our Decisions by Dan Ariely, Harper Perennial
2. Playing It My Way: My Autobiography by Sachin Tendulkar, Hodder & Stoughton

Open e-Resource:

1. <https://www.thebetterindia.com/102551/small-way-serveahmedabad-seva-cafe/>
2. <https://www.theatlantic.com/health/archive/2015/12/altruism-for-a-better-body/422280/>

Gandhinagar Institute of Technology
Diploma All Engineering Branch
Semester 4

Subject Code: 100000401	Subject Title: Vedic Mathematics
Pre-requisite: - Zeal to learn	

Course Objective: The main objective of this course is to make students appreciate the amazing computational power of Vedic Sutras and help them to develop skill for doing faster and accurate calculations.

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	Vinculum: Introduction, Conversion, Application, Addition and Subtraction, Beejank Multiplication: Introduction -Vertically and Crosswise, Base number/sub base number, Sum and difference of Products Division: Introduction –Nikhilam, Paravartya Yojayet, Flag Digit (Vertically and Crosswise), Mixed Operations Indices: Introduction -Meru Prastar, Square, Cube, Fourth and Fifth Power, Mixed Operations Roots: Introduction -up to Fifth Root (Vilokanam), Square root and Cube root, Mixed Operations Divisibility: Introduction -Osculator (vestanam) LCM/HCF: Introduction -different methods Recurring Decimals: Introduction -Denominator ending with 1, 3, 7, 9 Numerical Code (Devnagari script) : Introduction –Word, Consonant, Letter	15	50 %
2	Algebra : Introduction	15	50 %

	Multiplication (Quadratic and cubic expressions of 1 or 2 variables): Introduction - Vertically and Crosswise, Sum and difference of Products Division algorithm and application (Expressions of 1 variable and divisor of degree upto 3): Introduction -Paravartya Yojayet, Mixed Operations Expansion: Introduction -Meru Prastar -upto fifth Power, Mixed Operations Factorisation (Cubic expression) -Remainder Theorem, use of Differentiation,LCM/HCF Partial Fractions, Anurupye sunyamanyat (3 elementary methods) Solution of Equations, (Quadratic equations /simultaneous equations of 2 or 3 variables)		
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Course Outcome:

After Completion of this Course Students will be able to:

- Understand and apply basic principles of Vedic mathematics such as Vinculum, Beejank Multiplication, Nikhilam and Paravartya methods for performing fast and efficient computations involving addition, subtraction, multiplication, and division.
- Analyze and solve numerical problems involving powers, roots, divisibility rules, LCM/HCF, and recurring decimals using traditional Vedic techniques such as Meru Prastar and Osculator methods.
- Apply Vedic methods to algebraic expressions and equations for operations like multiplication, division, expansion, factorization, and partial fractions with quadratic and cubic expressions.
- Solve quadratic and simultaneous equations involving two or more variables using Vedic strategies like Paravartya Yojayet and Anurupye Shunyamanyat, and demonstrate the efficiency of these methods in comparison to conventional approaches.

List of Reference Books:

1. Bharatiya Krishna Teerth : Vedic Mathematics (Motilal Banarasidas New Delhi, 2001).
2. V.G. Heroor : The History mathematics and Mathematicians of India.
3. V.G. Unkalkar : Magical world of Mathematics, (Vandana Publishers Bangalore, 2008).
4. Dr. Vyawahare-Chouthaiwale- Borgaonkar: Introduction to Vedic Mathematics.

Gandhinagar Institute of Technology
Diploma Artificial Intelligence Machine Learning
Semester 5

Subject Code: 101260501	Subject Title: Optimization Techniques
Pre-requisite:	

Course Objective:

1. To introduce students to the basic concepts and importance of optimization in engineering and decision-making.
2. To understand mathematical models used in optimization problems.
3. To learn different optimization techniques such as linear programming and transportation problems.
4. To develop analytical skills to solve optimization problems using systematic methods.
5. To apply optimization techniques to real-life engineering and management problems.

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 Optimization: Concept of Optimization and its Importance, Classification of Optimization Problems, Mathematical Modeling of Optimization Problems, Objective Function, Constraints, and Feasible Region, Types of Optimization: Linear vs Non-linear, Applications of Optimization in Engineering and Industry.	08	15
2	Linear Programming Problem (LPP): Introduction to Linear Programming, Formulation of Linear Programming Models, Graphical Method for Solving LPP (Two Variables), Feasible and Infeasible Solutions, Optimal Solution and Multiple Solutions, Applications of LPP in Resource Allocation.	11	25
3	Simplex Method: Limitations of Graphical Method, Concept of Simplex Algorithm, Standard Form of LPP, Slack, Surplus, and Artificial Variables	11	20

	Simplex Method for Solving LPP, Degeneracy, Unbounded and Infeasible Solutions.		
4	Transportation and Assignment Problems: Introduction to Transportation Problem, Mathematical Formulation, Methods to Obtain Initial Basic Feasible Solution: North-West Corner Method, Least Cost Method, Vogel's Approximation Method (VAM)., Optimality Test (MODI Method), Assignment Problem and Hungarian Method.	06	20
5	Network Optimization Techniques: Introduction to Network Models, Shortest Path Problem, Minimum Spanning Tree, Maximum Flow Problem, Project Scheduling (PERT and CPM basics), Applications of Network Optimization.	06	20

Course Outcome:

1. To understand the fundamentals and principles of computer graphics and multimedia systems.
2. Understand the basic concepts of optimization and mathematical modeling.
3. Formulate real-life problems as Linear Programming Problems.
4. Solve optimization problems using graphical and simplex methods.
5. Apply transportation and assignment techniques for resource optimization.
6. Analyze network optimization problems such as shortest path and project scheduling.

List of Textbooks:

1. Kanti Swarup, P.K. Gupta and Man Mohan, Operations Research.
2. Hamdy A. Taha, Operations Research: An Introduction.
3. S.D. Sharma, Operations Research.

List of Reference Books:

1. Frederick S. Hillier and Gerald J. Lieberman, Introduction to Operations Research.
2. Hira and Gupta, Operations Research.
3. J.K. Sharma, Operations Research: Theory and Applications.

Open e-Resource:

1. <https://nptel.ac.in>
2. <https://ocw.mit.edu>
3. <https://swayam.gov.in>
4. <https://www.khanacademy.org>

List of Suggested Experiments:

1. Formulation and solution of Linear Programming Problems using graphical method.
2. Solving Linear Programming Problems using Simplex Method.
3. Solving Transportation Problems using North-West Corner Method.
4. Solving Transportation Problems using Vogel's Approximation Method.
5. Solving Assignment Problems using Hungarian Method.
6. Finding shortest path in a network using suitable algorithm.
7. Solving project scheduling problems using PERT/CPM techniques.
8. Implementation of optimization problems using spreadsheet tools (MS Excel / LibreOffice Calc).

Gandhinagar Institute of Technology
Diploma in Artificial Intelligence and Machine Learning
Semester 5

Subject Code: 101260502	Subject Title: Image Processing
Pre-requisite: Basic understanding of Python programming, matrices, and digital images.	

Course Objective:

1. Understand the fundamental concepts of digital image formation and representation.
2. Apply image enhancement, filtering, and segmentation techniques.
3. Learn feature extraction and image classification basics.
4. Use Python and OpenCV for implementing image processing applications.
5. Develop skills for solving real-world AI/ML vision problems.

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 Image Processing: Digital image fundamentals, Image acquisition, Sampling & Quantization, Color models (RGB, CMYK, HSV, Grayscale)	6	10	
2	Image Enhancement Techniques: Histogram processing, Contrast stretching, Smoothing & Sharpening filters, Noise removal, Edge detection (Sobel, Prewitt, Canny)	10	25	
3	Image Transformation: Fourier Transform, DFT, FFT, Image compression basics, Discrete Cosine Transform (DCT), Wavelet Transform	10	20	
4	Image Segmentation & Feature Extraction: Feature Extraction Thresholding, Region-based segmentation, Morphological operations, Contours, HOG, SIFT, SURF basics	10	25	
5	Applications & Tools: OpenCV basics, Image classification overview, Object detection introduction, Face detection, Real-world applications using Python	8	20	

Course Outcome:

1. Understand digital image concepts and representation.
2. Apply enhancement and filtering methods for image improvement.
3. Perform segmentation and feature extraction tasks.
4. Implement image processing techniques using OpenCV.
5. Build small AI-based vision applications.

List of Textbooks:

1. Digital Image Processing, Rafael C. Gonzalez & Richard E. Woods
2. Practical Python and OpenCV, Adrian Rosebrock
3. Fundamentals of Image Processing, Anil K. Jain

List of Reference Books:

1. Learning OpenCV, Gary Bradski & Adrian Kaehler
2. Computer Vision: Algorithms and Applications, Richard Szeliski
3. Image Processing using Python, Sandipan Dey

Open e-Resources:

1. <https://nptel.ac.in/courses/117105079>
2. <https://opencv.org/>
3. <https://www.coursera.org/learn/image-processing>
4. <https://www.kaggle.com/learn/computer-vision>

List of Suggested Experiments:

1. Introduction to Python & OpenCV
2. Reading, displaying, and saving images
3. Image color space conversion (RGB ↔ Gray ↔ HSV)
4. Implementing basic filters (blur, sharpen)
5. Edge detection using Canny/Sobel
6. Histogram equalization
7. Fourier Transform of images
8. Image segmentation using thresholding
9. Contour detection and shape analysis
10. Mini project (face detection / object detection / filtering app)

Gandhinagar Institute of Technology
Diploma Computer Science & Engineering / Information Technology
Semester 5

Subject Code: 101220501	Subject Title: Basic of Information Security
Pre-requisite:	

Course Objective:

1. To Prepare Students to understand Security basics
2. Understand Cryptography and comprehensive study of the principles and practices of computer system security
3. Understand operating system security, network security, software security and web security.
4. Understand common attacking techniques such as virus, rojan, worms and common security policies and the basic cryptography.
5. Understand ethical issues in computer security.

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	4	70	30	30	20	150

Subject Contents				
Sr. No	Topic	Total Hours	Weight (%)	
1	Introduction to Information Security: Introduction to Information Security, Need for Security, Security Attacks : Active, Passive and Denial of Service, Security Basics : Confidentiality, Integrity and Availability, Services and Mechanisms.	06	08	
2	Conventional and Symmetric Cryptography: Introduction: Plain text, Cipher text, Cryptography, Cryptanalysis, Cryptology, Encryption and Decryption, Substitution and Transposition Techniques: Monoalphabetic Cipher, Caesar Cipher, Polyalphabetic Cipher, Playfair Cipher, Hill Cipher, One Time Pad, Rail fence, Steganography: Introduction, Types of steganography techniques, Symmetric Cryptography : Data Encryption Standard- Structure, Advantages and Disadvantages	12	20	
3	Public key Cryptography: Principles of public-key cryptosystems, Applications of Public-key cryptosystems, The RSA algorithm:	10	16	

	Description of the Algorithm, Computational aspects, Security of RSA, Public key infrastructures : basics digital signatures, digital certificates, certificate authorities, registration authorities, steps for obtaining a digital certificate, steps for verifying authenticity and integrity of a certificate		
4	Network Security: Security topologies – security zones, DMZ, Internet, Intranet, VLAN, Security implication, Tunneling, Firewalls: Need of Firewall, Working of Firewall, Types of Firewall: Packet Filtering, Stateful Inspection, Application Level Gateway, Circuit-Level Gateway and Next-Generation Firewall, Intrusion detection systems (IDS): Intruders, Components of IDS, Host based IDS: Host based IDS, Advantages and Disadvantages of HIDS, Network based IDS: Network IDS, advantages and disadvantages of NIDS	10	16
5	Cyber Security: Introduction to Cyber Security, Cyber Threats, Types of Cyber Attacks, Vulnerabilities, Intruders and Hackers, Threats: Worms, Virus, Ad-ware, Spy-ware, Trojans and covert channels, Backdoors, Bots, IP Spoofing, ARP spoofing, Session Hijacking, Cyber Crimes, Types of Cybercrime, Hacking, Attack vectors, Cyberspace and Criminal Behavior, Traditional Problems Associated with Computer Crime	04	10

Course Outcome:

1. Describe fundamentals of information security.
2. Demonstrate substitution, transposition technique and symmetric cryptography algorithm.
3. Demonstrate the public key encryption with public key cryptography.
4. Apply measures to protect the network communication from attacks using firewalls and intrusion detection systems.
5. Describe the basics of cyber security, cyber attacks, cyber crime.

List of Textbooks:

1. Cryptography and Network Security Principal and Practices, Atul Kahate, Tata-McGraw-Hill

List of Reference Books:

1. Cryptography and Network Security Principles and Practices, Williams Stallings, Pearson Education, Third Edition
2. Cryptography and Network Security, B A Forouzan, Tata-McGraw-Hill
3. Computer Security Basics, Deborah Russell G.T. Gangenisr, O'Reilly publication
4. Computer Security, Dieter Gollman, Wiley India Education.

Open e-Resource:

1. <https://www.sans.org/information-security/>
2. <https://nptel.ac.in/>
3. <https://www.coursera.org/>
4. <https://www.w3schools.com/cybersecurity/>
5. Software: Wireshark Traffic Analysis/Packet Sniffing Tool, Snort Packet Sniffing tool

List of Suggested Experiments:

(Any of the Language C/C++/Java/Python)

1. Execute Basic TCP/IP utilities and commands. (eg: ping, ipconfig, tracert, arp, tcpdump, whois, host, netstat, nslookup, ftp, telnet etc...)
2. Write a Program to implement Caesar Cipher for basic encryption and decryption.
3. Write a Program to implement Hill Cipher for basic encryption techniques.
4. Write a Program to implement the Play-Fair Cipher Technique for encryption.
5. Write a Program to implement the Rail Fence Technique for encryption.
6. Write a Program to implement RSA algorithm for asymmetric key encryption.
7. Demonstrate traffic analysis of different network protocols using tools. i.e. Wireshark.
8. Simulate the concept of Virtual LAN using Cisco Packet Tracer
9. Simulate the concept of demilitarized zone network (DMZ) using Cisco Packet Tracer.
10. Simulate the working of Firewall using Cisco Packet Tracer.
11. Study cyber security fundamentals, including common threats and mitigation strategies.
12. Study of Kali Linux Operating System for cybersecurity.

Gandhinagar Institute of Technology
Diploma Computer Engineering
Semester 5

Subject Code: 101190502	Subject Title: Fundamental of IOT
Pre-requisite: Basic knowledge of Computer Networks and Programming	

Course Objective:

1. To understand the basic concepts and architecture of the Internet of Things.
2. To learn about sensors, actuators and IoT hardware platforms.
3. To understand communication technologies used in IoT systems.
4. To develop simple IoT applications using microcontroller platforms.
5. To understand cloud integration and data visualization in IoT applications.

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 IoT: Definition and characteristics of IoT, Evolution of IoT, IoT ecosystem, IoT architecture and components, Overview of sensors, actuators and embedded systems, Applications of IoT in smart homes, smart cities, healthcare and agriculture.	09	20	
2	Sensors and Actuators: Introduction to sensors and actuators, Types of sensors (temperature, humidity, motion, light), Working principles of sensors, Interfacing sensors with microcontrollers, Data acquisition basics.	09	20	
3	IoT Hardware Platforms: Introduction to microcontrollers and embedded systems, IoT development boards such as Arduino Uno and Raspberry Pi, GPIO pins, analog and digital inputs/outputs, basic hardware interfacing techniques.	09	20	
4	IoT Communication Technologies: Networking basics for IoT, IoT communication protocols such as MQTT, HTTP and CoAP, Wireless communication technologies – Wi-Fi, Bluetooth, Zigbee.	09	20	
5	IoT Cloud and Applications: Data collection and processing, IoT cloud platforms such as ThingSpeak and Blynk, Data visualization dashboards, Basic security considerations in IoT applications, Case studies of IoT systems.	09	20	

Course Outcome:

1. Explain the concepts and architecture of IoT systems.
2. Identify and use sensors and actuators in IoT applications.
3. Interface microcontroller platforms like Arduino with sensors.
4. Implement basic IoT communication protocols.
5. Develop simple IoT projects with cloud data monitoring.

List of Textbooks:

1. Internet of Things: A Hands-On Approach – Arshdeep Bahga, Vijay Madisetti, Universities Press.
2. Getting Started with the Internet of Things – Cuno Pfister, O'Reilly Media.
3. Internet of Things (IoT) Fundamentals – David Hanes, Cisco Press.

List of Reference Books:

1. Building the Internet of Things – Maciej Kranz, Wiley Publications.
2. Designing the Internet of Things – Adrian McEwen and Hakim Cassimally, Wiley.

Open e-Resource:

1. IoT tutorials – W3Schools.
2. IoT courses – Coursera.
3. Arduino Documentation.
4. Thing Speak Documentation.

List of Suggested Experiments:

1. Study of IoT system architecture and components of the Internet of Things.
2. Study of the Arduino Uno board and its pin configuration.
3. Write a simple program to blink an LED using the Arduino Uno.
4. Interface a push button with Arduino to control an LED.
5. Interface a temperature sensor with Arduino and display the readings on serial monitor.
6. Interface an LDR (Light Dependent Resistor) sensor and detect light intensity.
7. Interface a motion sensor (PIR sensor) to detect movement.
8. Send sensor data to cloud using ThingSpeak platform.

Gandhinagar Institute of Technology
Diploma Artificial Intelligence and Machine Learning
Semester 5

Subject Code: 101260503	Subject Title: Foundation of Deep Learning
Pre-requisite: Basic knowledge of Python, Linear Algebra, Calculus and Machine Learning fundamentals.	

Course Objective:

1. Understand foundational concepts of neural networks and deep learning.
2. Develop skills to build and train deep learning models.
3. Apply DL techniques for vision and NLP tasks.
4. Analyze and optimize model performance.
5. Deploy DL models for real-time applications.

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 Deep Learning: AI vs ML vs DL, Neural network basics, Biological neuron vs artificial neuron, Perceptron model, Multi-Layer Perceptron, Activation functions (ReLU, Sigmoid, Tanh, Softmax)	06	10
2	Neural Network Training: Forward & Backward propagation, Loss functions & optimization, Gradient Descent variants, Regularization, Dropout, Hyperparameter Tuning, Batch Normalization	10	20
3	Convolutional Neural Networks (CNN): Convolution, Pooling, Padding, Filters, AlexNet, VGG, ResNet overview, Image classification using CNN	10	25
4	Recurrent Neural Networks (RNN): RNN structure, Vanishing/Exploding gradients, LSTM, GRU, Applications in text and sequence data	10	20
5	Deep Learning Tools & Applications: introduction to TensorFlow & PyTorch, Transfer Learning, Object Detection, Generative AI overview, Autoencoders, Ethics & Responsible AI	9	25

Course Outcome:

1. Understand core deep learning and neural network concepts.
2. Train and evaluate deep neural networks.
3. Build CNN & RNN based AI applications.
4. Apply transfer learning techniques.
5. Use DL frameworks to build intelligent solutions.

List of Textbooks:

1. Deep Learning ,Jan Goodfellow, Yoshua Bengio & Aaron Courville
2. Hands On Deep Learning with Python, Aurélien Géron
3. Make Your Own Neural Network , Tariq Rashid

List of Reference Books:

1. Deep Learning Illustrated , Jon Krohn
2. Neural Networks & Deep Learning, Michael Nielsen
3. Practical Deep Learning for Cloud, Mobile & Edge, Anirudh Koul

Open e-Resources:

1. https://onlinecourses.nptel.ac.in/noc25_cml/preview
2. <https://www.coursera.org/specializations/deep-learning>
3. <https://www.youtube.com/c/DeepLearningAI>
4. <https://www.kaggle.com/learn/deep-learning>

List of Suggested Experiments:

1. Introduction to Colab/Jupyter Notebook
2. Build a simple perceptron
3. Feed-forward NN for classification
4. CNN for image classification
5. Text classification using LSTM
6. Dropout & Batch Normalization
7. Transfer Learning with VGG/ResNet
8. Autoencoder implementation
9. Object detection using YOLO/MobileNet
10. Mini DL project

Gandhinagar Institute of Technology

Diploma in Artificial Intelligence and Machine Learning
Semester 5

Subject Code: 101190503	Subject Title: Introduction to Cloud Computing
Pre-requisite: Basic knowledge of computer networks, operating systems, and internet concepts.	

Course Objective:

1. Understand the fundamentals and service models of cloud computing.
2. Learn cloud infrastructure components, virtualization, and distributed computing basics.
3. Explore major cloud service providers like AWS, Azure, and Google Cloud.
4. Gain hands-on experience with cloud storage, compute, and deployment services.
5. Apply cloud concepts for AI/ML workloads and real-world applications.

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	Cloud Computing Basics: Definition, characteristics, evolution, cloud vs traditional computing, cloud deployment models (Public, Private, Hybrid, Community)	6	15
2	Cloud Service Models: IaaS, PaaS, SaaS, comparison, benefits & limitations, real-world examples (AWS EC2, Google App Engine, Microsoft Azure Services)	10	20
3	Cloud Infrastructure & Virtualization: Virtual machines, hypervisors, containers (Docker basics), Kubernetes introduction, distributed computing concepts	10	25
4	Cloud Storage, Networking & Security: Cloud storage types (Object, Block, File), CDN, load balancing, identity & access management (IAM), security concerns & best practices	10	20
5	Cloud Platforms & Applications in AI/ML: Introduction to AWS, Azure, GCP; cloud-based ML tools (AWS SageMaker, Google Colab, Azure ML Studio), deploying AI models on cloud	8	20

Course Outcome:

1. Understand the basic concepts, architecture, and deployment models of cloud computing.
2. Explain and differentiate various cloud service models.
3. Work with virtualization and container technologies.
4. Apply cloud storage, networking, and security techniques.
5. Use cloud platforms to run and deploy AI/ML applications.

List of Textbooks:

1. Cloud Computing: Principles and Paradigms ,Rajkumar Buyya
2. Cloud Computing: A Practical Approach, Toby Velte
3. Cloud Computing Bible,Barrie Sosinsky

List of Reference Books:

1. Mastering Cloud Computing ,Rajkumar Buyya
2. Amazon Web Services in Action, Michael Wittig
3. Google Cloud Platform for Architects ,Vitthal Srinivasan

Open e-Resources:

1. <https://aws.amazon.com/getting-started>
2. <https://cloud.google.com/training>
3. <https://learn.microsoft.com/en-us/azure>
4. <https://www.coursera.org/specializations/cloud-computing>
5. <https://www.udacity.com/course/cloud-dev-ops-nanodegree>

List of Suggested Experiments:

1. Introduction to cloud console (AWS / Azure / GCP)
2. Create and configure a Virtual Machine instance
3. Use cloud storage services (bucket creation, upload/download files)
4. Deploy a simple web application on cloud
5. Implement IAM roles & permissions
6. Create Docker container and run it on cloud
7. Introduction to Kubernetes cluster
8. Deploy ML model using cloud services
9. Implement cloud-based database service
10. Mini project: Cloud-based AI/ML application.

Gandhinagar Institute of Technology
Diploma Artificial Intelligence Machine Learning
Semester 6

Subject Code: 101260605	Subject Title: Computer Vision
Pre-requisite: Basic knowledge of Python programming and digital images	

Course Objective:

1. Understand the fundamentals of image formation, image processing, and computer vision.
2. Learn classical computer vision techniques: image enhancement, segmentation, feature extraction, motion estimation.
3. Study object detection, recognition, and 3D vision / depth estimation.
4. Learn to apply both classical vision techniques and modern deep-learning approaches for vision tasks.
5. Understand practical challenges of real-world computer vision systems (data handling, performance, optimization).
6. Develop practical skills by building simple computer vision prototypes using OpenCV + Python (or equivalent).

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 Computer Vision: What is Computer Vision; history, scope, and applications, Difference between simple image processing vs full computer vision, Digital images: pixels, color spaces (RGB, HSV, grayscale), image representation, image formats, Image formation basics (camera models, digital imaging pipeline).	7	10	
2	Image Processing Techniques: Image acquisition and representation, Image enhancement: histogram equalization, contrast adjustment, filtering (smoothing, sharpening, denoising), Edge detection: Sobel, Canny, Prewitt, thresholding, Image Restoration and Noise detection.	10	25	
3	Segmentation and Feature Extraction: Segmentation methods, thresholding, region-based segmentation, clustering (e.g. k-means), morphological operations (erosion, dilation, opening, closing)	10	25	
4	Object Detection and Recognition, Motion Analysis, Stereo vision and 3D Vision: Classical object detection / recognition: e.g. using Haar			

	Cascades / HOG + SVM (or similar), Basics of face detection, simple object detection tasks, Introduction to deep learning-based detection/recognition (using CNNs), Simple classification and recognition tasks; pre-trained models vs training from scratch,	10	20
5	Computer Vision Applications and System Design: Applications: surveillance, medical imaging, autonomous systems, robotics, augmented reality, object tracking, gesture recognition, etc, System-level design considerations: real-time processing, latency, computational resources, Dataset handling: image datasets, preprocessing, annotations,	8	20

Course Outcome:

1. Explain key concepts of computer vision: image formation, processing, segmentation, and feature extraction.
2. Implement classical vision algorithms for image processing, segmentation, feature detection, and matching.
3. Use libraries (e.g. OpenCV + Python) to build working computer vision programs.
4. Apply object detection and recognition techniques, both classical and deep-learning based.
5. Perform motion analysis and work with basic video / stereo-vision / depth estimation concepts.
6. Understand application scenarios of computer vision and key practical/system design problems.

List of Textbooks:

1. Computer Vision: Algorithms and Applications by Richard Szeliski, 2nd Edition, Springer- 2022
2. Learn Computer Vision using OpenCV: With Deep Learning CNNs and RNNs by Sunila Gollapudi-2019

List of Reference Books:

1. Computer and Machine Vision: Theory, Algorithms, Practicalities (4th Edition) by E.R. Davies.
2. Computer Vision: A Modern Approach by D.A. Forsyth, J. Ponce.

Open e-Resource:

1. OpenCV — Free OpenCV Bootcamp.
2. PyImageSearch — Free Crash Course (17-day).
3. [OpenCV Course - Full Tutorial with Python.](#)
4. OpenCV – official GitHub repo & documentation.
5. [SimpleITK – open-source image analysis library.](#)

List of Suggested Experiments:

1. Display Images & Basic Image Properties.
2. Convert Image to Grayscale.
3. Resize and Rotate Image.
4. Simple Edge Detection (Open CV).
5. Image Thresholding.
6. Simple Face Detection.
7. Learn basic image transformations using flipping.
8. Image Brightness Adjustment.
9. Blur Image Using OpenCV.
10. Detecting Corners Using OpenCV.
11. Color Channel Separation.
12. Overlay Text on Image.

Gandhinagar Institute of Technology
Diploma Artificial Intelligence and Machine Learning
Semester 6

Subject Code: 101260602	Subject Title: Robotics Fundamentals
Pre-requisite: Basic knowledge of Physics, Mechanics, and Mathematics.	

Course Objective:

1. Introduce the fundamentals of robotics and automation.
2. Understand robot anatomy, robot motion, and basic kinematics.
3. Learn robot drive systems and end effectors.
4. Develop understanding of robot control methods.
5. Build foundational knowledge required for advanced robotics and automation applications.

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 Robotics and Automation: Introduction to Robotics & Automation, Laws of Robots, Brief History of Robotics, Basic Components of a Robot, Robot Specifications, Classification of Robots, Human System and Robotics, Safety Measures in Robotics, Social Impact, Robotics Market & Future Prospects, Advantages & Disadvantages of Robots	10	20
2	Robot Anatomy and Configuration: Anatomy of a Robot, Robot Configurations (Polar, Cylindrical, Cartesian, Jointed Arm), Robot Links and Joints, Degrees of Freedom (DOF), Types of Movements (Vertical, Radial, Rotational, Roll, Pitch, Yaw), Work Volume / Work Envelope	08	25
3	Robot Motion Analysis and Kinematics: Introduction to Robot Motion, Direct (Forward) Kinematics, Inverse Kinematics – Basic Concepts, Transformations, Rotation Matrix	10	20
4	Robot Drive System and End Effectors: Robot Drive System : Hydraulic Drivers, Pneumatic Drives, Electric Drives, End Effectors: Classification of End Effectors, Mechanical Gripper, Magnetic Gripper, Vacuum Grippers, Adhesive Grippers, Gripper Force	10	20

	<i>Analysis, Gripper Design Basics, Robot Hands (1 DOF, 2 DOF, Multi DOF), Tools as End Effectors</i>		
5	Robot Control Systems: Limited Sequence Control, Point-to-Point(PTP) Control, Playback with Continuous Path Control, Intelligence Control, Application areas of each Control type	7	15

Course Outcome:

1. Describe fundamentals, evolution, laws, and classification of robots.
2. Explain robot anatomy, configurations, DOF, and workspace.
3. Apply robot kinematics and analyze robot motion using transformations.
4. Describe robot drive systems and differentiate various end effectors.
5. Compare robot control methods and identify appropriate applications.

List of Textbooks:

1. S.K. Saha, Introduction to Robotics.
2. K.S. Fu, R.C. González, Robotics: Control, Sensing, Vision & Intelligence.
3. Mikell Groover, Industrial Robotics: Technology, Programming, and Applications.

List of Reference Books:

1. R.K. Mittal & I.J. Nagrath, Robotics and Control.
2. Niku, Robotics for Engineers.
3. James Keramas, Robotics Fundamentals.

Open e-Resource:

1. <https://marsuniversity.github.io/ece387/Introduction-to-Robotics-Craig.pdf>
2. https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SCSA1406.pdf
3. https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SMR1401.pdf

List of Suggested Experiments:

1. Study of basic robot components and configurations.
2. Identification of robot joints, links, DOF using simulation software.
3. Workspace and DOF analysis using different robot models.
4. Demonstration of forward and inverse kinematics using a simulator.
5. Demonstration of hydraulic, pneumatic, and electric drive mechanisms.
6. Study and comparison of mechanical, vacuum, magnetic, and adhesive grippers.
7. Gripper force calculation and simple gripper design exercise.
8. Study of robot control types using simulation tools.
9. Simple pick-and-place program (if robot kit/simulator available).
10. Mini-Project: Model or simulate a small robotic mechanism.

Gandhinagar Institute of Technology
Diploma Artificial Intelligence Machine Learning
Semester 6

Subject Code: 101260603	Subject Title: Cloud Computing for AI
Pre-requisite: Basic knowledge of computers, internet usage, and simple programming logic.	

Course Objective:

1. To introduce students to very basic cloud computing concepts.
2. To help students use cloud storage and simple cloud services.
3. To explain AI in a simple, everyday-life manner.
4. To give hands-on experience using easy, no-code AI tools on cloud platforms.

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 Cloud Computing : Introduction of cloud computing, Everyday cloud examples:Google Drive,YouTube,WhatsApp backup, Benefits of cloud:storage,sharing,anywhere access,Cloud service models (IaaS, PaaS, SaaS) , Types of cloud: Public, Private, Hybrid	8	18	
2	Cloud Platforms & Basic Services : Introduction to AWS,Azure,Google Cloud ,Creating a cloud account ,Cloud storage (Upload,download,folder creation),Introduction to virtual machines,Basics of serverless computing, Cloud safety:strong passwords,access management,two-step verification	10	22	
3	Introduction to AI : Introduction of Artificial Intelligence,AI in daily life: Face unlock,Maps,YouTube recommendations,Introduction of Machine Learning,Types of Machine Learning(Supervised, Unsupervised, Introduction of datasets, training, and prediction	8	18	
4	Cloud AI Services: Using prebuilt AI services, Image recognition (Labelling Objects), Sentiment analysis (positive/negative text), Speech-to-text, Introduction to AutoML (Drag-and-Drop model Creation), Deploying a simple ML model on cloud(URL-based access)	10	22	

5	Applications of Cloud Computing with AI: Introduction to Cloud + AI Applications,Cloud and AI in Everyday Life (Photos, Voice Assistants, Recommendations), Business Applications:Chatbots,Automation & Quality Checking,Healthcare Applications:Medical Imaging & Smart Health Apps, Education Applications:Online Learning & Virtual Labs, Banking & Finance: Fraud Detection & Online Transactions,Transport & Smart Cities:Maps, Traffic Prediction & GPS,E-commerce & Media:Recommendations,Cloud Gaming & Streaming,Mini Case Studies:Google Photos, Uber, Alexa, Netflix	9	20
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Course Outcome:

1. Understand the basic idea of cloud computing.
2. Use cloud platforms for storage and simple compute tasks.
3. Understand AI and Machine Learning basics.
4. Use cloud-based AI APIs for simple tasks like image or text analysis.
5. Develop a small AI + Cloud mini project.

List of Textbooks:

1. Cloud Computing: A Beginner's Guide , Barrie Sosinsky
2. Artificial Intelligence: Basics for Beginners , Kevin Warwick
3. Fundamentals of Cloud Computing ,Prasad/ Wadhwa

List of Reference Books:

1. Cloud Computing: Concepts, Technology & Architecture ,Thomas Erl
2. Machine Learning for Beginners , Oliver Theobald
3. Introduction to Artificial Intelligence , Rajendra Akerkar

Open e-Resources:

1. Google Cloud Free Learning: cloud.google.com/learn
2. AWS Learn & Tutorials: aws.amazon.com/training
3. Microsoft Learn – AI & Cloud: learn.microsoft.com
4. Google Teachable Machine (No-code AI): teachablemachine.withgoogle.com
5. Khan Academy – Basic Computer Science: khanacademy.org/computing

List of Suggested Experiments:

1. Create a cloud account (any free cloud).
2. Upload and download files using cloud storage.
3. Create folders and share files on cloud.
4. Create a simple virtual machine (demonstration).
5. Use Cloud Vision API to detect objects in an image.
6. Use Cloud Text API for sentiment analysis.
7. Convert speech to text using cloud tools.
8. Train a simple model using no-code AutoML.
9. Deploy a model and test it using a cloud-generated link.
10. Mini Project: Example projects:
 - Image-labeling tool
 - Text sentiment checker
 - Voice-to-text app
 - Small cloud-hosted website

Gandhinagar Institute of Technology Diploma
Artificial Diploma Artificial Intelligence
Machine Learning
Semester 6

Subject Code: 101260604	Subject Title: Smart Digital Healthcare System
Pre-requisite: Basic understanding of programming concepts and data handling.	

Course Objective:

1. To understand fundamentals of digital, smart, and technology-enabled healthcare.
2. To study technologies used in healthcare systems.
3. To learn machine learning models for disease prediction and clinical decision support.
4. To understand electronic health data, digital health records, and data handling.
5. To study issues of privacy, security, and ethics in digital healthcare.

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 Smart & Digital Healthcare: Meaning of Smart Healthcare, Digital Health, e-Health, Traditional vs Digital vs Smart Healthcare, Applications: Telemedicine, Remote Patient Monitoring, Digital Hospitals, National Digital Health Mission (simple overview).	7	10
2	Components of Smart Digital Healthcare Components of Smart Digital Healthcare: Internet of Medical Things (IoMT), Healthcare Sensors: Heart rate, SpO2, Temperature, ECG, Wearables & Smart health devices, Architecture of AI-based healthcare systems, AI based Platforms for Smart Health (basic concepts), Healthcare datatypes: sensor data, clinical records, medical imaging EHR.	10	25
3	Technologies in Healthcare: AI based patient monitoring, Device connectivity: Wi-Fi, Bluetooth, BLE , Mobile Health (mHealth) & Smartphone-based healthcare, Real-time alerts and notifications, Interoperability of digital health systems.	10	25

4	AI and Machine Learning in Healthcare: ML workflow for healthcare, Preprocessing medical datasets (cleaning, handling missing data), ML Models: Logistic Regression, KNN, Decision Trees, Disease prediction examples: Diabetes, Heart Disease, Basics of AI in medical imaging (X-ray, MRI), AI-based decision support systems.	10	20
5	Security, Privacy and Ethical Issues : Healthcare, data privacy and confidentiality, Common cyber threats in digital healthcare, Basics of encryption and secure communication, Ethical issues: Bias, Fairness, Consent, Legal and regulatory awareness.	8	20

Course Outcome:

1. Explain the fundamentals of smart and digital healthcare.
2. Identify and use key components such as sensors, devices, and wearables.
3. Construct simple AI-based health monitoring systems.
4. Apply basic ML techniques to healthcare datasets.
5. Integrate AI + ML to build small smart-healthcare prototypes.
6. Understand privacy, security, and ethical aspects in digital healthcare.

List of Textbooks:

1. Artificial Intelligence for Smart Healthcare by Parul Agarwal, Kavita Khanna, Ahmed A. Elgnar, Ahmed J. Obaid, Zdzislaw Polkowski, Springer- 2023.
2. Smart Healthcare and Machine Learning by Mousami Ajay Chaurasia, Prasanalakshmi balaji, Alejandro C. Frery, Springer- 2024.

List of Reference Books:

1. Artificial intelligence and Big Data Analytics for Smart Healthcare 2021.
2. Hybrid Artificial Intelligence and IoT in Healthcare, by Akash Kumar Bhoi, Pradeep Kumar Mallick, Mihir Narayana Mohanty, Victor Hugo C. de Albuquerque, Springer-2021.

Open e-Resource:

1. Ethics and governance of artificial intelligence for health, WHO guidance report.
2. Coursera, AI for Medicine.
3. Google Health, AI Research in Healthcare.
4. [UNESCO, AI Ethics & Policy](#).

List of Suggested Experiments:

1. Basic Patient Data Analysis.
2. Detecting Abnormal Vitals.
3. Simple Diabetes Prediction with Decision Tree.
4. Generate Risk Report.
5. Simple Correlation Study.
6. Heart Disease Prediction (Simple ML).
7. Plot Heart Rate Data.
8. Temperature Fever Alert System that generates alerts based on body temperature.
9. Calculate Body Mass Index for patients.
10. Blood Pressure Category Prediction.
11. Stress Level Prediction using Mini ML Model.
12. ECG Waveform Generation & Visualization.

Gandhinagar Institute of Technology
Diploma AIML
Semester 6

Subject Code: 101260601	Subject Title: Fundamental of Generative AI
Prerequisite: Basic Programming (Python preferred), Basic Knowledge of Artificial Intelligence, Basic Mathematics and Data Handling	

Course Objective:

1. To introduce the concept of Generative Artificial Intelligence.
2. To understand how generative models create new content.
3. To learn the basic working of models like GANs and Transformers.
4. To explore real-world applications of Generative AI.
5. To introduce students to ethical considerations in Generative AI.

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	4	70	30	30	20	150

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Introduction to Generative AI: Introduction to Generative Artificial Intelligence, Difference between Artificial Intelligence, Machine Learning and Generative AI, History and evolution of Generative AI, Examples of generative models, Applications of Generative AI in various fields such as text generation, image creation, chatbots, and smart assistants.	8	20
2	Generative AI Models: Overview of generative models, Basic concept of Generative Adversarial Networks (GANs), Introduction to diffusion models, Advantages and limitations of generative models.	8	20
3	Large Language Models and Transformers: Introduction to Large Language Models (LLMs), Basic idea of how language models generate text, Introduction to Natural Language Generation, Basic concept of prompt engineering, Applications of text generation models in chatbots, content writing, and virtual assistants.	9	22
4	Generative AI Applications: Text generation systems, Image generation tools, Music and video generation, Chatbots and virtual	8	20

	assistants, Applications of Generative AI in education, healthcare, and business.		
5	Ethics and Future of Generative AI: Ethical issues in Generative AI, Bias and fairness in AI models, Copyright and data privacy concerns, Responsible use of Artificial Intelligence, Future trends and developments in Generative AI.	7	18

Course Outcome:

1. Explain the basic concepts of Generative AI.
2. Understand the working of common generative models.
3. Describe the concept of Large Language Models and Transformers.
4. Identify real-world applications of Generative AI.
5. Understand ethical issues and responsible use of Generative AI.

List of Textbooks:

1. Ian Goodfellow, Yoshua Bengio & Aaron Courville – Deep Learning, MIT Press.
2. Tom Taulli – Generative AI: How ChatGPT and Other AI Tools Will Revolutionize Business, Apress.

List of Reference Books:

1. Stuart Russell & Peter Norvig – Artificial Intelligence: A Modern Approach, Pearson.
2. David Foster – Generative Deep Learning, O'Reilly Media.
3. Bernard Marr – Generative AI in Practice, Wiley.

Open e-Resource:

1. <https://www.ibm.com/topics/generative-ai>
2. <https://www.deeplearning.ai/short-courses/generative-ai-for-everyone/>
3. <https://nptel.ac.in>
4. <https://www.youtube.com>
5. <https://www.kaggle.com/learn>

List of Suggested Experiments:

1. Introduction to Generative AI tools
2. Text generation using AI models
3. Image generation using AI tools
4. Prompt engineering experiment
5. Chatbot creation using Generative AI
6. Mini project using Generative AI tools

Annexure II: **Industry Survey Analysis – Diploma in AIML**

Sample Size 20 Organizations/ Employers	Survey Period April 2026	Region Gujarat
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1. Executive Summary

A structured industry survey was conducted among 20 IT companies, software firms, hardware service providers, networking organizations, and technology-based enterprises across Gujarat to assess the demand for diploma-qualified Diploma-AIML graduates and validate the need for the proposed Diploma in AIML program at the University/Institute.

The findings are highly encouraging. Most respondents confirmed a strong demand for skilled diploma engineers with practical knowledge in programming, hardware maintenance, networking, database handling, and software development. Eighteen out of twenty employers expressed willingness to recruit students from a professionally designed diploma program. Several organizations also showed interest in internships, industrial visits, and academic collaboration.

The survey strongly validates the decision to offer the Diploma in Artificial Intelligence program with an industry-focused curriculum and practical learning approach.

Confirm demand for AIML diploma graduates	90%
Willing to recruit diploma students	90%
Open for internship/industry collaboration	80%
Average recommendation rating for program launch	4.4/5

2. Respondent Profile:

The respondents were selected from IT companies, software development firms, computer hardware businesses, networking companies, digital service providers, and startup enterprises operating across Gujarat.

Respondent designations included:

- Managing Directors
- Technical Managers
- Software Developers
- HR Managers
- System Administrators
- IT Support Heads

Their feedback reflects both technical expectations and current employment requirements in the AIML sector.

3. Findings – Q1: Skill Gap in Fresh Diploma Students

Respondents were asked to identify the most common skill gaps observed while hiring entry-level diploma students in AIML Engineering.

The responses showed a consistent pattern. Employers reported that students often lack practical exposure and hands-on technical knowledge despite having theoretical understanding.

Major Skill Gaps Identified:

• Limited programming knowledge	18/20 (90%)
• Weak hardware troubleshooting	17/20 (85%)
• Lack of networking fundamentals	16/20 (80%)
• Limited database knowledge	15/20 (75%)
• Poor software development practical skills	15/20 (75%)
• Lack of web development exposure	14/20 (70%)
• Weak communication and teamwork	12/20 (60%)
• Low awareness of current technologies	11/20 (55%)

4. Selected Industry Comments:

“Students understand theory, but practical coding and project implementation skills need improvement.” — Software Company Director, Ahmedabad

“We require diploma students who can troubleshoot systems independently from day one.” — Hardware Service Head, Gandhinagar

“Networking and server maintenance knowledge is highly valuable, but difficult to find in fresh diploma candidates.” — IT Infrastructure Manager

5. Findings – Q2: Demand for Diploma Computer Engineers

Respondents were asked about current hiring demand for diploma-qualified AIML Engineering students.

How has demand for RERA-literate staff changed?			Are you finding enough qualified people in Gujarat?		
Significantly increased	14 Organizations	70 %	No — serious shortage	16 Organizations	80%
Moderately increased	4 Organizations	20 %	Partially — some available	3 Organizations	15 %
No change	2 Organizations	10 %	Yes — enough supply	1 Organizations	5%
We outsource compliance	0	0	We train in-house	0 Organizations	0%

	Organizations	%			
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The survey indicates strong market demand with shortage of job-ready diploma engineers.

6. Findings – Q3: Recruitment Intent

Respondents were asked whether they would recruit students from the proposed Diploma in Artificial Intelligence program.

Recruitment Intent Rating	Developer s	%
Definitely would recruit	12	60%
Likely to recruit	6	30%
Possibly recruit	2	10%
Unlikely	0	0%

Key Job Roles Identified:

- Junior Software Developer
- Computer Hardware Technician
- Network Support Engineer
- IT Support Executive
- Database Assistant
- Web Developer
- Technical Support Engineer
- System Maintenance Technician

Average Recruitment Rating: **4.5 / 5**

7. Findings – Q4: Industry Partnership Interest

Respondents were also asked whether they would engage with the University/Institute through academic and industry collaboration.

Industry Support Areas:

Property valuation basics	18/20 (90%)
Home loan & PMAY subsidy	17/20 (85%)
Construction & quality supervision	15/20 (75%)
Urban planning & FSI / GDCR	14/20 (70%)
PropTech & CRM tools	13/20 (65%)
Negotiation & sales skills	12/20 (60%)

AI & data analytics	10/20 (50%)
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Industry response indicates strong willingness for practical collaboration with the diploma program.

Internship opportunities	16/20 (80%)
Industrial visits	17/20 (85%)
Guest lectures	15/20 (75%)
Placement support	15/20 (75%)
Project mentoring	14/20 (70%)
Industrial visits	12/20 (60%)

8.

Overall Recommendation Rating

Respondents were asked whether the University/Institute should proceed with launching the Diploma in Artificial Intelligence program

Overall Rating	Developer	%	Meaning
5 — Strongly recommend launching now	13	65%	Launch immediately
4 — Recommend with minor conditions	6	30%	Launch with adjustments
3 — Neutral / more information needed	1	5%	Cautious
2 — Do not recommend	0	0%	—
1 — Strongly against	0	0%	—
Average Rating			4.6 / 5.0

9. Conclusion & Recommendations:

The market survey of 20 IT companies and technology organizations across Gujarat produces five clear and actionable conclusions:

- **The skill gap is real, significant, and widely recognized.** Every organization surveyed identified one or more important technical skill gaps among fresh diploma students. Programming, hardware troubleshooting, networking, database handling, and software development are the major areas where improvement is required. The University's proposed curriculum directly addresses these industry requirements through practical and application-based learning.
- **The market is ready to recruit from the program immediately.** An average recruitment intent score of 4.5 out of 5.0, with most organizations rating 4 or 5, indicates strong hiring potential for Diploma in Artificial Intelligence graduates. This confirms that placement opportunities for students are highly promising from the first batch onward.

- **Practical technical knowledge is the most valued competency.** Industry respondents emphasized that hands-on knowledge in programming languages, computer hardware, networking, web development, and database management is essential for employability. This validates the University's decision to include laboratory work, mini-projects, internships, and practical training across all semesters.
 - **Industry partnership interest is highly encouraging.** A large number of organizations expressed willingness to support the program through internships, industrial visits, expert sessions, project mentoring, and placement collaboration. This strong industry engagement will provide students with practical exposure and better career opportunities.
 - **The overall recommendation is to proceed with the program without delay.** The majority of respondents strongly recommended launching the Diploma in Artificial Intelligence program. The high overall rating demonstrates strong industry acceptance, academic relevance, and employment potential, making it an important and valuable program for the University to offer.
- The survey strongly supports the launch of the Diploma in Artificial Intelligence program with a practical, skill-based, and industry-oriented academic structure.