GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

Competency-focused Outcome-based Green Curriculum-2021 (COGC-2021)
Semester-II

Course Title: Fundamentals of Information Technology Systems
(Course Code: C4321702)

Diploma program in which this course is offered	Semester in which offered
Instrumentation and Control Engineering	Second

1. RATIONALE

Over the years, the Information Technology industry has become a key driver of science and economy. Our personal and professional lives are impacted by technology in almost every way. In today's economy, the IT industry profoundly impacts almost all other sectors. Information technology is playing a key role in India's transition to knowledge-based economies.

The main goal of this course is to enable new Instrumentation technicians to identify the need for IT Infrastructure setup and to utilize resources, structures, and applications.

2. COMPETENCY

Students should learn and practice different types of skills within the course content in order to gain the following competencies:

i. Configure and Operate computer system confidently.
ii. Demonstrate mature use of Internet for self and society.
iii. Be familiar with the latest industry trend regarding IoT.

3. COURSE OUTCOMES (COs)

On completion of this course, the student should be able to:

a. Explain the basic structure of IT enabled system and enlist various applications of it. [R,U]
b. Illustrate the importance of IT systems in Data Acquisition and Processing. [R,U,AP]
c. Illustrate the importance of Network and it's components in IT enabled System. [R,AP]
d. Summarize the recent advanced applications of information technology Systems (IoT). [R,U]
e. Utilize different IT applications responsibly for self-improvement and the betterment of society. [AP]

4. TEACHING AND EXAMINATIONSCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P/2)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	CA	ESE	CA	ESE	
2	0	4	4	30*	70	25	25	150

(*):Out of 30 marks under the theory CA, 10 marks are for assessment of the micro-project to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken

during the semester for the assessing the attainment of the cognitive domain UOs required for the attainment of the COs.
***Legends: L**-Lecture; T – Tutorial/Teacher Guided Theory Practice; P -Practical; C – Credit, **CA** -Continuous Assessment; **ESE** -End Semester Examination.*

5. SUGGESTED PRACTICALEXERCISES

Following practical outcomes (PrOs) are the subcomponents of the Course Outcomes (Cos). Some of the **PrOs** marked ***'*'*** are compulsory, as they are crucial for that particular CO at the 'Precision Level' of Dave's Taxonomy related to 'Psychomotor Domain'.

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1	Dissemble and Identify Motherboard, CPU, SMPS, Expansion slots, Drives, Storage devices.	I	2*
2	Install, connect and utilize the functions of computer peripherals like printers, scanners, and external storage drives.	I	2
3	Install/uninstall application software using the control panel.	II	2
4	Create users with full control, limited control.	II	2
5	Set screensaver and energy management in Windows and Set window Resolution.	II	2
6	Install a peripheral/printer/scanner driver on the computer system.	II	2
7	Create a remote desktop and share files/data using any remote login method.	II	2
8	Create a Document for an article for a given college magazine using utility software (Word/document software). **OR** Create an Advertisement Flyer/ Pamphlet (Word/document software).	II	2*
9	Create a presentation (10 slides) on any topic related to "recent trends in instrumentation & Control Engineering" using utility software (PowerPoint/ presentation software). **OR** Create a presentation on the topic of measurement devices/instrumentation.(PowerPoint/presentation software)	II	2*
10	Create a marksheet of a student for the class 10 board exam (use formulas and other functionalities) using utility software. (Excel/spreadsheet) **OR** Create an electricity bill for residential house (use formulas and other functionalities) using utility software. (Excel/ spreadsheet).	II	2*
11	Draw a neat Layout of the network setup of a given laboratory/department.	III	2
12	Set Up a computer with proper IP and subnet for a local Network.	III	2
13	Find an IP address, Network mask, Computer Name in the local Network. Rename the computer name with the given name.	III	2

14	Create a Shared sheet (Google sheet) among a given group to collect enrollment number, name, gender, std 10 mathematics marks, std 10 science marks. std 10 total marks, std 10 total obtained marks. **OR** Create a Google form among a given group to collect enrollment number, name, gender, std 10 mathematics marks, std 10 science marks. std 10 total marks, std 10 total obtained marks, and collect the responses.	III	2*
15	Use Google maps and find out the location of the institute and use the navigation to reach the institute from the hostel/ home/ nearest railway or bus station. (Students have to just search for different means to reach viz, car walk, bike, bus, train etc) and compare different navigation ways for time and traffic. **OR** Use Google maps and Google assistant and find out the location of the nearest Library, Police station, hospital, petrol pump, supermarket, heritage site and use the navigation to reach (students have to just search for different means to reach viz, car walk, bike, bus train, etc) and compare different navigation ways for time and traffic. (Students should use Android tablet/Smartphone)	III	2
16	Create a group mail, add classmates to group mail, and send them 'Welcome E-Mail'.	III	2
17	Apply, Remove and Change the password of the given computer system.	III	2
18	Identify various parts of the given Arduino Uno board and enlist various Functions of each part.	IV	2
19	Download and Install Arduino IDE software and connect the Arduino Uno board with the system (PC or LAPTOP).	IV	2
20	Identify various parts of the given Raspberry pi board and enlist various functions of each part. Use and display of IoT communication. (e.g. Free MQTT client mobile app and free MQTT web broker)	IV	2*
21	Install mobile apps provided by the government for e-governance, security on Android tablet/ Smartphone and utilize them for Government to citizen services and prepare a report on their functionality (use apps like Swachhata app, my gov app, digital Gujarat app (for scholarship and other docs), citizen first app (Gujarat police) , m-parivahan, m-kisan, ayush, sanjivani, MyHealth-Record, etc). Prepare a report on its functionalities and impact of IT on Government to citizen services. (Minimum three different sectors)	V	2
22	Install e-learning apps on Android Smartphone/ tablet and use them as a learning resource to learn a topic from a given curriculum of the current semester (any subject) and prepare a report on its functionalities and impact of IT on education. (Olabs, Vlabs, SWAYAM, spoken tutorial, edX etc).	V	2*
23	Install any net banking app and demonstrate the use of (National Electronic Funds Transfer) NEFT, (Real Time Gross Settlement) RTGS, and (Integrated Management System) IMPS.	V	2
24	Demonstrate use of Debit cards, Credit cards, and UPI for online payment.	V	2

25	Install any payment service provider app (digital wallet app) and demonstrate various tasks like payment, money transfer, linking of the bank account.	V	2
26	Use any available online video conferencing app and organize an online group discussion on any topic related to cyber security, and "awareness for responsible use of social media. Record the discussion and record the attendance. Prepare a list of useful tips and precautions discussed in online meetings. (Students are required to organize online meetings under the supervision of the instructor).	V	2*
	Minimum 26 Practical Exercises		**52**

Note

i. *More **Practical Exercises** can be designed and offered by the respective course teacher to develop the industry-relevant skills/ outcomes to match the COs. The above table is only a suggestivelist.*

ii. *Care must be taken in assigning and assessing study reports as it is a first-year study report. The study report, data collection, and analysis report must be assigned in a group. The teacher has to discuss the type of data (which and why) before the group starts their market survey.*

The following are some **sample** 'Process' and 'Product' related skills (more may be added/deleted depending on the course) that occur in the above listed **Practical Exercises** of this course required which are embedded in the COs and ultimately the competency.

Sr. No.	Sample Performance Indicators for the PrOs	Weightage in %
1	Lab Record	05
2	Answer one question from Computer Basics & Internet	20
3	Writing steps on any two (one each from Section – II, III)	20
4	Executing of two exercises	25
5	Result /Printout	10
6	Viva Performance	20
Total		**100**

6. MAJOR EQUIPMENT/ INSTRUMENTSREQUIRED

These major equipment with broad specifications for the PrOs is a guide to procure them by the administrators to the user in uniformity of practicals in all institutions across the state.

- Computer
- Projector
- Equipment like Printer, Scanner, MODEM.
- Raspberry pi KIT
- Arduino UNO board
- Smart Device/ Smart phone with android/ios operating system.

7. AFFECTIVE DOMAINOUTCOMES

The following ***sample*** Affective Domain Outcomes (ADOs) are embedded in many of the above-mentioned COs and PrOs. More could be added to fulfill the development of this course competency.

a) Work as a leader/a team member.
b) Follow safety practices regarding cyber security while using the world wideweb.

The ADOs are best developed through laboratory/ field-based exercises. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

i. 'Valuing Level' in 1st year
ii. 'Organization Level' in 2nd year.
iii. 'Characterization Level' in 3rd year.

8. UNDERPINNINGTHEORY

The major underpinning theory is given below based on the higher level UOs of *Revised Bloom's taxonomy* that is formulated for the development of COs and competency. If required, more such UOs could be included by the course teacher to focus on the attainment of COs and competency.

Unit	Unit Outcomes (UOs) (4 to 6 UOs at different levels)	Topics and Sub-topics
Unit-I Basics of Information Technology and Computer System	1a. Differentiate Data, Information, and Knowledge. 1b. Outline interrelationship between data, process, and information. 1c. Illustrate IT infrastructure components. 1d. Explain block diagram of IT-enabled systems.	1.1 Information Technology: Understanding the need for Information, Data, and Knowledge. Difference between Data, Information and Knowledge. 1.2 Define: data, process, and information. The interrelationship between data, process and information. 1.3 The need of a process to define data and information. 1.4 IT Infrastructure Components: Computer Hardware, Software, Operating System, Network components. 1.5 Block diagram of IT-enabled systems.
Unit-II Basics of Data Acquisition and software.	2a. List and explain different types of sensors. 2b. Explain type of interfaces between sensor and processing unit. 2c. Illustrate components of computer-based processing systems. 2d. Summarize types of software, the importance of	2.1 Define Sensors and signals for data acquisition. 2.2 Interfaces between Sensor and processing unit: Simplex, Duplex. 2.3 Components of Computer-based processing systems: • Arithmetic and Logical Unit(ALU) • Control Unit(CU) • Memory Unit(RAM/ROM) • Storage Unit(HDD/SSD)

	different software, and their use. 2e. Illustrate need for Operating Systems. 2f. Explain the information processing cycle.	• Data and control bus • Input Devices(keyboard, pointing devices, mouse, touch screen, scanner) • Output Devices(CRT monitor, TFT monitor, LED monitor, plotter, speakers) 2.4. Types of software: Overview of the System software, Application software, Operating system, Utility software (Open Office, notepad, etc.), drivers, compilers and interpreters. 2.5. Operating system: Need for Operating System. 2.6. Information Processing Cycle
Unit-III Basics of Communication System, Networking, Internet and Its Applications.	3a. Justify the need for a communication system. 3b. Classifies media as guided and unguided media. 3c. Interpret different types of computer networks and their advantages. 3d. Interpret different types of computer networks and their advantages. 3e. Interpret the network topology. 3f. Identify different network devices. 3g. Distinguish the functions of various networking infrastructure devices. 3h. Explain different types of Internet connectivity. 3i. Discuss various internet protocols in brief. 3j. Summarize the concept of DNS in brief. 3k. Illustrate the usage of the internet.	3.1 Need for Communication System in IT-enabled systems. 3.2 Define: Signal Transmission Media 3.3 Cables and connectors for networking : Twisted pair, Coaxial cable, Fiber optics, Radio waves, Microwaves, Satellite RJ45, BNC, 7/16DIN,SC/LC, HDMI, USB etc. 3.4 Network advantages like resource sharing, file sharing, and common storage. 3.5 Types of network LAN, MAN, WAN and the layout of STAR, BUS, MESH and RING topology. 3.6 Networking infrastructure: Hub, Switch, Router, Repeater, Bridge, Gateway, Cables, and MODEM. 3.7 Internet Basics: DSL, Leased line connectivity, Wi-Fi Connection, Browsers: Firefox, Chrome. 3.8 Protocols: HTTP, HTTPS, WWW, IP (IPv4) (setting up an Internet connection on DSL, setting up Internet on the local network). 3.9 Enlist applications of Internet.
Unit-IV Advanced applications of information technology (IoT)	4a. Explain Basic components of IoT with Architecture. 4b. Discuss the need for IoT. 4c. Outline introduction of IoT hardware and software. 4d. List Challenges in IoT.	4.1 Introduction of IoT. 4.2 Evolution of IoT. 4.3 Basic Components and Architecture of IoT: Sensors/ Devices (Things), Connectivity, Data Processing, User Interface.

	4e. Cognize industrial IoT.	4.4 Introduction of IoT hardware and software. 4.5 Challenges in IoT. 4.6 Introduction to Industrial IoT.

Unit-V Societal Impacts of Information Technology	5a. Demonstrate social use of the World Wide Web (WWW). 5b. Show concern regarding Privacy, Security, and Integrity of Information. 5c. Discuss the need and importance of Intellectual Property Rights, Cyber Security laws. 5d. Discuss the advantages of using different e-governance platforms for government to citizen services in various sectors. 5e. Use e learning apps as a tool for ICT based learning. 5f. Demonstrate the use of various Net banking, Mobile Banking, and Payment applications with precaution and safety.	5.1 Introduction. 5.2 Social use of the World Wide Web (WWW). 5.3 Privacy, Security, and Integrity of information. Responsible use of social media platforms. 5.4 Intellectual Property Rights (IPR), Cyber Security laws. 5.5 E-learning, E-governance (e.g. Passport, Sarathi website, PAN card, OJAS, Aadhar card, digilocker). 5.6 Internet banking, Mobile banking, payment apps and services.

9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Basics of Information Technology and Computer System	4	5	7	2	**12**
II	Basics of Data Acquisition and software	8	9	9	4	**18**
III	Basics of Communication System, Networking, Internet and Its Applications	8	5	5	4	**20**
IV	Advanced applications of information technology (IoT)	4	4	4	2	**10**
V	Societal Impacts of Information Technology	4	3	3	4	**10**
	Total	**28**	**26**	**28**	**16**	**70**

Legends: *R=Remember, U=Understand, A=Apply and above (Revised Bloom's taxonomy)*

10. SUGGESTED STUDENTACTIVITIES

Other than the classroom and laboratory learning, the following are the suggested student-related ***co-curricular*** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should perform the following activities in a group and prepare reports of about 5 pages for each activity. They should also collect/record physical evidence for their (student's) portfolio which may be useful for their placement interviews:

a) Teachers guided self-learning activities: Course/ library/ internet/ lab based mini projects.
b) Students' activities like: course/ topic-based seminars; Internet-based assignments, a presentation on the Ethical use of IT infrastructure and social networks based on the

accumulated knowledge.

c) Prepare the compilation of IPR laws that exist in different countries.

d) Prepare a chart of steps required during IPR filing.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (ifany)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

a) Massive open online courses (***MOOCs***) may be used to teach various topics/subtopics.

b) Guide student(s) in undertaking micro-projects.

c) ***'L' in section No. 4*** means different types of teaching methods that is to be employed by teachers to develop the outcomes.

d) About ***20% of the topics/ sub-topics*** which are relatively simpler or descriptive in nature are to be given to the students for ***self-learning*** but to be assessed using different assessment methods.

e) With respect to ***section No.10***, teachers need to ensure to create opportunities and provisions for ***co-curricular activities***.

f) Helping the students to understand the concepts of the World Wide Web (WWW) and the Internet.

g) Introduce IPR guidelines and cyber laws among the students.

h) Department can arrange a visit to the cyber security cell of the district.

i) Department can arrange seminars on Cyber Security and IPR.

12. SUGGESTEDMICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her at the beginning of the semester. In the first four semesters, the micro-projects are group-based (group of 3 to 5). However, **in the fifth and sixth semesters**, the number of students in the group should ***not exceed three.***

The micro-project could be industry application-based, internet-based, workshop-based, laboratory-based, or field-based. Each micro-project should encompass two or more COs which are in fact, integration of PrOs, UOs, and ADOs. Each student will have to maintain a dated work diary consisting of individual contributions in the project work and give a seminar presentation of it before submission. The duration of the micro-project should be about **14-16** ***(fourteen to sixteen) student engagement hours*** during the course. The students ought to submit micro-project by the end of the semester to develop the industry-oriented COs.

A suggestive list of micro-projects is given here. This has to match the competency and the COs. Similar micro-projects could be added by the concerned course teacher:

a) Create a poster of the computer system.

b) Prepare network layout of various devices and systems in a given lab/department.

c) Arrange poster/ PPT presentations showing different network topologies and their comparisons.

d) Using various mathematical functions calculate the output for given values of input for given sensor/ transducer (ex. RTD) using its mathematical equation and plot its

characteristic using the chart function in excel.

e) Organize poster / PPT Presentation of the architecture of IoT.

f) Collect various cases of cyber frauds from newspapers and media and discuss those cases in groups and list out suggestions to avoid cyber frauds.

13. SUGGESTED LEARNINGRESOURCES

Sr. No.	Title of book	Author	Publication
1	Information Technology	Dennis P. Curtin, Kim Foley	Tata McGraw Hills. ISBN-13 : 978-0074635582
2	Introduction to Information Technology.	Turban, Rainer	Wiley ISBN-13: 978-0471347804
3	Computer Course	R Taxali	Tata McGraw Hills. ISBN: 9780070700376, 0070700370
4	FUNDAMENTALS OF COMPUTERS	V. RAJARAMAN (3RD EDITION)	Prentice Hall India Learning Private Limited. ISBN-13 : 978-8120350670
5	A COMPUTER LABORATORY REFERRAL FOR DIPLOMA & ENGINEERING STUDENTS	T.R.Jagadeesh, M.A. Jayaram, D.S.R.Prasad	UNIVERSITIES PRESS ISBN-13: 978-8173712586

14. SOFTWARE/LEARNINGWEBSITES

- http://www.olabs.edu.in/
- https://www.vlab.co.in/
- https://swayam.gov.in/
- https://spoken-tutorial.org/
- https://gujaratcybercrime.org/eng/
- https://www.meity.gov.in/content/information-technology-act-2000-0
- https://ipindia.gov.in/
- https://www.raspberrypi.org/
- https://www.arduino.cc/
- https://Javapoint.com/iot-internet-of-things
- https://Educba.com/iot
- https://data-flair.training/blogs/iot-careers

15. PO-COMPETENCY-COMAPPING

Semester II	Fundamentals of Information Technology Systems (Course Code: C4311702)						
	Pos						
Competency & Course Outcomes	PO 1 Basic & Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design/ develop-ment of solutions	PO 4 Engineering Tools, Experimentation & Testing	PO 5 Engineering practices for society, sustainability& environment	PO6 Project Manage-ment	PO 7 Life-long learning
Competency	Students should learn and practice different types of skills within the course content in order to gain the following competencies: i. Configure and operate computer system confidently. ii. Demonstrate mature use of internet for self and society . iii. Be familiar with the latest industry trend regarding IoT.						
Course Outcomes CO 1) Explain the basic structure of IT enabled system and enlist various applications of it.	1	-	-	1	2	-	1
CO 2) Illustrate the importance of IT systems in Data Acquisition and Processing.	2	-	-	1	2	1	1
CO 3) Illustrate the importance of Network and it's components in IT enabled System.	2	1	-	1	2	1	2
CO 4) Summarize the recent advanced applications of information technology Systems (IoT).	3	2	-	1	1	1	3
CO 5) Utilize different IT applications responsibly for self-improvement and the betterment of society.	1	1	-	2	3	-	3

*Legend: '**3**' for high, '**2**' for medium, '**1**' for low, and '**-**' for no correlation of each CO with PO.*

16. COURSE CURRICULUM DEVELOPMENTCOMMITTEE

GTU Resource Persons

Sr. No.	Name and Designation	Institute
1.	Shri Dhaval B. Dhokiya, Lecturer IC- Engineering.	A. V. Parekh Technical Institute, Rajkot
2.	Shri Jigar V. Jariwala, Lecturer IC- Engineering.	Government Polytechnic, Gandhinagar

3.	Shri Devarsh J. Modi, Lecturer IC- Engineering.	Government Polytechnic, Palanpur