GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

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

Course Title: **Introduction to IT Systems**
(Course Code: 4311602)

Diploma programme in which this course is offered	Semester in which offered
Information Technology	First

1. RATIONALE

Information technology is a relatively new comprehensive term that describes the entire range of information generation, storage, transmission, retrieval, and processing. Most organizations in the industry, business, non-profit organizations, and government departments now rely heavily on their information systems (IS) and information technology (IT). The information system collects, stores, and disseminates information from the organization's environment and internal operations to support organizational functions and decision-making, communication, coordination, control, analysis, and visualization. Therefore, the knowledge about the various applications areas of Information Technology including practical skills acquired through the laboratory will help students when he/she will be working with information systems.

At the end of the course, students will be able to comfortably work on computers, install and configure OS, connect it to external devices, protect information and computers from basic abuses/attacks. This course is therefore so designed that the students will be able to apply the concepts of IT systems as and when required.

2. COMPETENCY

The purpose of this course is to help the student to attain the following industry-identified competency through various teaching-learning experiences.

- **Apply concepts of Information Technology in various educational, business, and industrial application areas.**

3. COURSE OUTCOMES (COs)

The practical exercises, the underpinning knowledge and the relevant soft skills associated with the identified competency are to be developed in the student for the following Course Outcomes (COs) achievement :

a) Appraise the Information technology systems for various educational, business, and industrial applications.
b) Examine basic logic gates for designing digital logic circuits.
c) Configure features of different Operating Systems for various applications.
d) Demonstrate communication between two computer systems on a network.
e) Analyze different parameters of computer network- its communication cable/devices, topology, and addressing system.
f) Appraise information security for data protection and cyberattacks in network communication.

4. TEACHING AND EXAMINATION SCHEME

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	
3	0	4	5	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 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 PRACTICAL EXERCISES

The following practical outcomes (PrOs) are the sub-components of the COs.*These PrOs need to be attained to achieve the Cos.*

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	Identify specifications of various types of computer systems available in your institute	I	02
2	Install any two freeware or open-source software/tool by using Google Chrome/Mozilla Firefox/Microsoft Edge web browser.	I	02
3	Demonstrate participation in any three Digital India Platforms from the following to survey Digital literacy. Digital India Platforms: BHIM, Dig-Locker, e-rupi,m-parivahan	I	04 (02+02)
4	Convert given decimal number into another (HEXADECIMAL, OCTAL, DECIMAL, BINARY)	II	04 (02+02)
5	Verify the truth table of basic logic gates.	II	02
6	Verify the truth table and digital logic circuits of basic logic gates using NAND gate.	II	02
7	Design digital logic circuit functions of basic logic gates with the help of the universal gate-NOR Gate.	II	02
8	Demonstrate Windows-10 Operating System in a virtual machine using VMWare or VirtualBox.	III	04 (02+02)
9	Update the Operating System by using the recommended Setting from the Control Panel.	III	02
10	Install a given Linux Operating System by using VMWare or VirtualBox.	III	04 (02+02)
11	Install anyone from the given freeware application software/tool on your PC (Adobe PDF, notepad++, VLC media player, Skype)	III	02
12	Install given Open-Source application software/tool to your PC. (LibreOffice/Open Office)	III	02
13	Identify different aspects of the network in your department lab by following Parameter's consideration. (1) Types of Cables (Twisted -pair, Coaxial, Fiber Optics) (2) Topology (Bus, Mesh, Star, Ring, Hybrid) (3) Network Type (LAN, MAN, WAN)	IV	02

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
	(4) Ethernet Cable (Color code, Straight Cable, Cross Cable)		
14	Prepare a LAN cable with the help of a crimping tool.	IV	02
15	Demonstrate following Networking Commands for troubleshooting. Commands: ping, traceroute, hostname, netstat, nslookup, route	V	04 (02+02)
16	Identify your Desktop/Laptop IP Address by the following. (1) Ipconfig command (2) Default/Manual Network & Internet setting	V	02
17	Identify specifications of the various network connecting devices at your Institute's Lab.	V	02
18	Install any three peripheral devices from the following in your Desktop/Laptop. List of Peripheral Devices: -Computer Mouse (Wired/Wireless) -Webcam -Microphone -Digital Camera -Scanner -Printer -USB Flash Drive -Smartphone or Tablet Computer Storage Interface -CD/DVD Drive	V	04 (02+02)
19	Connect two computer systems without using any connecting device (use cross cable)	V	02
20	Compile various cyber incidents by visiting the site https://cert-in.org.in/.	VI	02
21	Analyze suspicious files and URLs to detect types of malwares by using https://www.virustotal.com/	VI	02
22	Prepare a document by using various digital platforms, newspapers or any social media platform to identify cyber-crimes that have been done in your city.	VI	02
	Total		**56**

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 suggestive list.*

*ii. 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..*

S. No.	Sample Performance Indicators for the PrOs	Weightage in %
1	Analyze and identify suitable approach for problem solving	25
2	Use of appropriate technology/software/tools	25
3	Demonstrate problems as per instructions.	25
4	Interpret the result and conclusion	15
5	Prepare a report/presentation for given problem	15
Total		**100**

6. MAJOR EQUIPMENT/ INSTRUMENTS AND SOFTWARE REQUIRED

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

S. No.	Equipment Name with Broad Specifications	PrO. No.
1	Computer System (Desktop/Laptop) with minimum configuration: Operating System: Windows 7 or later version, Linux (Red Hat, Fedora, Ubuntu RAM:2 GB (4 GB preferable), HDD: 250 GB (500 GB preferable) MS-Office :2010 (2016 preferable)	All
2	Electronic Workbench/MultiSIM/Virtual Lab e-yantra.	5,6,7
3	Crimping tool, RJ-45 connector (male-female), Twisted pair cable	14

7. AFFECTIVE DOMAIN OUTCOMES

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

a) Follow safety practices.
b) Practice good housekeeping.
c) Demonstrate working as a leader/a team member.
d) Maintain tools and equipment
e) Follow ethical practices.

The ADOs are best developed through the 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. UNDERPINNING THEORY

The major underpinning theory is given below based on the higher level UOs of *Revised Bloom's taxonomy*that are formulated for development of the COs and competency. If required, more such UOs could be included by the course teacher to focus on 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 System**	1.1. Describe Information System and its components 1.2. Describe the anatomy of a computer system 1.3. Utilize the Internet for various applications	1.1.1 Importance of information technology in the modern era. - Information Concepts - Information v/s knowledge - Components Of Information System 1.2.1 Hardware Components of computer system - Memory (Primary and secondary) - Motherboard - Peripherals 1.3.1 Google Search Engine - Introduction - Google Search Query 1.3.2 Applications of Internet Digital Platforms - (BHIM, Digi-Locker, m-parivahan, NSDL, Digital Gujarat, passport seva, e-rupi.....)
Unit – II **Digital Logic**	2.1. Convert Binary numbers into different number systems. 2.2. Classify Basic Logic gates and Universal Gates 2.3. Design simple digital logic circuit function using basic universal logic gates.	2.1.1 Introduction to digital computers and number system - Binary numbers - Base conversions (Binary, Decimal, Hexadecimal, Octal) 2.2.1 Working of Logic gates - AND, OR, INVERTER, XOR, XNOR 2.2.2 Working of Universal Gates - NAND Gate - NOR Gate 2.3.1 Simplification of basic logic gates using Universal gates (Both NAND and NOR)
Unit– III **Operating System**	3.1. Explain the functions and services of OS. 3.2. Explain the different types and purposes of the operating system. 3.3. Install Windows/Linux Operating System using a hypervisor. 3.4. Differentiate between	3.1.1 General features of OS - Introduction - Need, Functions, Services 3.2.1 Types of OS - Batch Operating System. - Multitasking/Time-Sharing OS. - Multiprocessing OS. - Real-Time OS. - Distributed OS.

Unit	Unit Outcomes (UOs) (4 to 6 UOs at different levels)	Topics and Sub-topics
	licensed and freeware software.	- Network OS. - Mobile OS 3.3.1 Windows & Linux Operating System - Microsoft Windows OS (History Basic Features, Current State of OS) - Linux Operating System (Architecture, Components of Linux System, Kernel Mode vs User Mode, Basic Features) 3.4.1 Proprietary & Open-source software
Unit– IV **Information Communi-cation System**	4.1. Explain the basic terminology-Transmission modes, serial and parallel concepts of an information communication system 4.2. Classify the concepts of Modulation & Multiplexing for Digital Communication 4.3. Describe various wired media for digital communications.	4.1.1 Basic terminology of information communication - Basic Structure - Transmission modes (Simplex, half-duplex, Full-duplex) - Synchronous and Asynchronous transmission - Serial and Parallel communication 4.2.1 Modulation (Definition and Need) - Types of Analog Modulation - Types of Digital Modulation (Diagrams) - Multiplexing Concept and types - TDM, FDM, OFDM 4.3.1 Wired media - Twisted -pair, - Coaxial, - Fiber Optics, - RJ-45 connectors 4.3.2 Ethernet Cable - Color code - Straight Cable - Cross Cable
Unit– V **Networking**	5.1 Explain OSI Model and its layers for data communication. 5.2 Compare various computer network topologies and types of networks. 5.3 Explain use of IP addressing system, DNS, communication devices in Internet and Intranet.	5.1.1 OSI Model - Working & Functioning of each layer - Name of Protocols supported at each layer - Name of Hardware supported at each layer. 5.2.1 Network Topologies - Bus, Mesh, Star, Ring, Hybrid 5.2.2 Types of Computer Networks

Unit	Unit Outcomes (UOs) (4 to 6 UOs at different levels)	Topics and Sub-topics
	5.4. Describe functions of Networking Devices	- LAN - MAN - WAN 5.3.1 Network Addressing (IPv4) - Internet Protocol (need, types) - Classful addressing scheme, Address space, notations, netid, hostid - Need of IPv6 5.3.2 Introduction to various IEEE 802 Standards 5.3.3 DNS - Introduction, Need - Domain Names & its types 5.3.4 Internet & Intranet - URL - Internet - Intranet - Comparison between Intranet & Internet 5.4.1 Networking Devices (Types & use) - Hub, Switch, Router, Bridge, Gateway, Modem, Repeater, Wireless Access Point, NIC
Unit– VI Information Security	6.1. Explain concepts of Information Security for Data Protection. 6.2. Classify various cyber-attacks. 6.3. Describe cyber laws for data protection and IPR	6.1.1 Need for Information Security - Definition of various terms of Information Security. - Cryptography - Vulnerability - Threat - Attack - Encryption - Decryption 6.1.2 The Principles of Security & Confidentiality, Integrity, Availability (CIA triad) 6.1.3 Security services 6.2.1 Cyberattacks - Introduction of common types of attacks (Malware, Man-in-the-middle attack, Denial-of-service attack, SQL injection, Zero-day exploit, Phishing, Password cracking.) 6.3.1 Cyber Law - IT Amendment Act 2008 (Section 66 & 67)

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 System	06	2	4	2	08
II	Digital Logic	06	2	2	4	08
III	Operating System	06	2	6	4	12
IV	Information Communication System	10	4	6	6	16
V	Networking	10	4	6	6	16
VI	Information Security	04	2	6	2	10
Total		**42**	**16**	**30**	**24**	**70**

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

Note*: This specification table provides general guidelines to assist students for their learning and to teachers to teach and question paper designers/setters to formulate test items/questions to assess the attainment of the UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may slightly vary from above table.*

10. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, 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 following activities in group and prepare reports of about 5 pages for each activity. They should also collect/record physical evidences for their (student's) portfolio which may be useful for their placement interviews:

a) Prepare a portfolio for the Digital India platform and identify digital services for Indian citizens.
b) Give a seminar on latest technologies & applications in demand.
c) Identify the existing network structure of your home.
d) Prepare a casestudy on cyber-crime.
e) Undertake micro-projects in teams.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:Massive open online courses (***MOOCs***) may be used to teach various topics/subtopics.

a) Guide student(s) in undertaking micro-projects.
b) ***'L' in section No. 4***means different types of teaching methods that are to be employed by teachers to develop the outcomes.
c) 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.
d) With respect to ***section No.10***, teachers need to ensure to create opportunities and provisions for ***co-curricular activities***.
e) Guide students for using data manuals.

12. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project 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, an integration of PrOs, UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The duration of the microproject 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) **Digital India Platform**: Demonstrate the various Digital India initiatives to create awareness about Digital literacy.
b) **Operating System**: Install any flavor of the Linux Operating System by using the virtualization Software (VMware/virtual box).
c) **Networking**: Prepare a report of various Network connecting devices existing at your home/ Institute Lab.
d) **Information Security:** Prepare a case study of various cyber-attacks in the current marketplace.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication with place, year and ISBN
1.	Digital Design (4th Edition)	M. Morris Mano; Michael D. Ciletti	Pearson publication, Latest Edition ISBN: 81-203-0417-9
2.	Operating systems	Dhamdhere	Tata McGraw Hill ISBN: 1282187244, 9781282187245
3.	Operating systems	Silberschatz, Galvin, Gagne	Wiley & Sons publication ISBN: 978-0-470-12872-5
4.	Data Communications and Networking	Behrouz Forouzan	Tata McGraw Hill ISBN: 978-0-07-296775-3
5.	Cryptography and network security	William Stallings	Prentice Hall ISBN: 978-0130914293

14. SOFTWARE/LEARNING WEBSITES

a) https://www.digitalindiaportal.co.in/
b) https://www.khanacademy.org/
c) https://getintopc.com/
d) https://filehippo.com/
e) https://nptel.ac.in/
f) https://magazine.opensourceforu.com/
g) https://www.electronicsforu.com/
h) https://www.redhat.com/en
i) https://www.netacad.com/
j) https://www.cert-in.org.in/

15. PO-COMPETENCY-CO MAPPING

Semester I	Introduction to IT Systems (Course Code: 4311602)						
	POs						
Competency & Course Outcomes	PO 1 Basic & Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design/ develop-ment of solutions	PO 4 Engineer-ing Tools, Experimen-tation & Testing	PO 5 Engineering practices for society, sustainability & environment	PO 6 Project Manage-ment	PO 7 Life-long learning
Competency	**Apply concepts of Information Technology in various educational, business and industrial application areas.**						
Course Outcomes							
CO1: Appraise the of Information technology systems for applications.	3	-	-	2	2	-	3
CO2: Examine basic logic gates for designing digital logic circuits.	2	-	2	2	-	-	-
CO3: Configure features of different Operating Systems for various applications.	3	2	-	3	2	2	2
CO4: Demonstrate communication between two computer systems on a network. .	2	-	-	2	2	-	-
CO5: Analyze different parameters of computer network- its communication cable/devices, topology, and addressing system.	3	-	-	3	2	-	-
CO6: Appraise information security for data protection and cyberattacks in network communication.	3	3	-	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 DEVELOPMENT COMMITTEE

GTU Resource Persons

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