

Jharkhand University of Technology

Ranchi, 834010

Diploma – Computer Science Engineering



SYLLABUS

**For Diploma Program in
Computer Science Engineering
(Effective from 2024-25)**

DEPARTMENT OF COMPUTER SCIENCE ENGINEERING

(3rd – SEMESTER)

Advanced Python Programming

Subject code – CSE301

1. RATIONALE

In previous semester (Semester II) students have learned basics of python programming. They understand developing programs to solve simple problems using various features of the 'Python' language. Python is a modern language useful for writing compact codes specifically for programming in the area of Server-side Web development, Data Analytics, AI, and scientific computing as well as production tools and game programming. This course deals with some advanced features of the 'Python' language. The programming skills thus acquired can be used for developing programs with advanced level programming features which in turn will be helping in developing practical applications for the scientific, research and business purposes. At the end of the course, the student will be able to develop programs with adequate advanced concepts using python language.

2. COMPETENCY

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

- **Develop a program using advanced python language concepts to solve the given problem.**

3. COURSE OUTCOMES (COs)

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

The student will develop underpinning knowledge, adequate programming skills of competency for implementing various applications using python programming language to attain the following course outcomes.

- a) Develop python programs by applying data structures - dictionary, tuple, and set concepts.
- b) Develop modules and packages in python programs for modular programming approach.
- c) Implement error handling techniques using exception handling.
- d) Develop python programs using file input/output operations.
- e) Draw graphics using the turtle module.

4. CONTENT

Unit	Outcomes	Topics and Sub-topics
Unit – I Basic of python data structure - Dictionary, Tuple and Set	1.1 Use of String and list operations in python programs. 1.2 Use built-in functions for Set manipulation. 1.3 Use of Tuple operations in python programs. 1.4 Use built-in functions for Dictionary manipulation.	1.1.1 Introduction to Strings, Lists 1.2.1 Set <ul style="list-style-type: none"> • Sets in Python • Create a Set, Accessing Python Sets, Delete from sets, Update sets • Python Set Operations 1.3.1 Tuple <ul style="list-style-type: none"> • Tuples in Python • Creating Tuples • Accessing Tuple <ul style="list-style-type: none"> ○ Iterate over tuples ○ Slicing tuples • Tuples are Immutable • Python Tuple Operations • Built-In Tuple Functions and methods 1.4.1 Dictionary <ul style="list-style-type: none"> • Dictionaries in Python • Creating Dictionaries • Accessing Items in Python Dictionaries • Add, Update, Remove in Dictionaries • Properties of Dictionary Keys • Built-In Dictionary Methods and functions
Unit – II Modules and Packages	2.1 Describe creating and importing module 2.2 Describe creating and importing package 2.3 PIP - Package Installer for Python	2.1.1 Introduction to module 2.1.2 Creating user defined module 2.1.3 Importing a module in python <ul style="list-style-type: none"> • Normal import • From import • From import with * 2.1.4 Module search path 2.2.1 Introduction to Packages 2.2.2 Creating user defined package 2.2.3 Importing a package in python <ul style="list-style-type: none"> • Normal import

		<ul style="list-style-type: none"> • From import • From import with * 2.2.4 Intra-package References 2.3.1 Installing PIP 2.3.2 Installing/uninstalling python packages
Unit– III Exception n handling	3.1 Explain errors & exceptions 3.2 List types of Exceptions 3.3 Implement Raising Exceptions 3.4 Implement Handling Exceptions	3.1.1 Introduction to Exception 3.2.1 Types of Exceptions : <ul style="list-style-type: none"> • Built-in Exceptions • User defined Exceptions 3.3.1 Raising Exceptions 3.4.1 Handling Exceptions <ul style="list-style-type: none"> • Try clause • Except clause • Finally clause
Unit– IV Files Handling	4.1 List types of file 4.2 Explain basics of file creation, reading and writing in context to file handling. 4.3 Explain setting file offsets 4.4 Explain Object Serialization.	4.1.1 Introduction to files and its types. <ul style="list-style-type: none"> • Binary files • Text files 4.2.1 Opening and Closing Text File 4.2.2 Reading and Writing Files 4.3.1 Setting Offsets in File 4.4.1 Object Serialization - PickleModule
Unit– V Graphics withTurtle	5.1 Explain turtle graphics module 5.2 Implement graphics using turtle 5.3 Use loops and conditional statements to draw graphics	5.1.1 Introduction to turtle graphics 5.2.1 Turtle methods 5.2.2 Turtle Screen Methods 5.3.1 Turtle programming - loops and conditional statements.

Advanced Python Programming Lab

Subject code – CSE301P

PRACTICAL EXERCISES

S. No.	Practical	Unit No.	Approx. Hrs. required
1	Write a program to demonstrate the set functions and operations.	I	02
2	Write a program to input n numbers from the user and store these numbers in a tuple. Print the maximum and minimum number from this tuple.	I	02
3	Create a user-defined function that prints a tuple whose values are the cube of a number between 1 and n (both included), Where n is an integer number and passed as an argument.	I	02
4	Write a program to input names of n employees and store them in a tuple. Also, input a name from the user and find if this employee is present in the tuple or not.	I	02
5	Write a program to demonstrate tuples functions and operations	I	02
6	Create a dictionary with the roll number, name, and marks of n students in a class and display the names of students who have scored marks above 75.	I	02
7	Write a program to count the number of times a character appears in a given string using a dictionary.	I	02
8	Write a user-defined function to convert a number entered by the user into its corresponding number in words. For example, if the input is 789 then the output should be 'Seven Eight Nine '.	I	02
9	Write a program to concatenate the following dictionaries to create a new one. Sample Dictionary: dic1={1:10, 2:20} dic2={3:30, 4:40} dic3={5:50,6:60} Expected Result: {1: 10, 2: 20, 3: 30, 4: 40, 5: 50, 6: 60}	I	02
10	Write a program to demonstrate the dictionaries functions and operations.	I	02
11	Write a program to define a module to find the area and circumference of a circle. a) Import the module to another program. b) Import a specific function from a module to another program.	II	02

12	Create a package named Demo Package which contains two modules named mathematics and greets. The mathematics module contains sum, average, power functions, and the greets module contains the say Hello function. a) import the module from a package to another program. b) import a specific function from a module.	II	02
13	Install urllib3 package using PIP. Send HTTP requests to any URL and print status for the same.	II	02
14	Write a program to catch on Divide by zero Exception with finally clause.	II I	02
15	Write a user-defined exception that could be raised when the text entered by a user consists of less than 10 characters.	II I	02
16	Write a python program to demonstrate exception handling.	II I	02
17	Write a program to read the content of file line by line and write it to another file except for the lines containing "a" letter in it.	I V	02
18	Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order.	I V	02
19	Write a program to create a binary file to store Rollno and Name, Search any Rollno and display name if Rollno found otherwise "Rollno not found".	I V	04
20	Write a program to demonstrate the file and file I/O operations.	I V	02
21	Draw square, rectangle, and circle using Turtle.	V	02
22	Draw color-filled shapes (square, rectangle, and circle) using Turtle.	V	02
23	Draw a smiling face emoji and rainbow using Turtle.	V	04
24	Draw an Indian Flag and an Olympic Symbol using Turtle	V	04
25	Draw a chessboard using Turtle.	V	02
	Total		56

MAJOR EQUIPMENT/ INSTRUMENTS 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 with operating system: Windows 7 or higher Ver., macOS, and Linux, with 4GB or higher RAM, Python versions:2.7.X, 3.6.X	Al 1
2	Python IDEs and Code EditorsOpen Source : IDLE, Jupyter	

SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication with place, year and ISBN
1	Learn Programming in Python with Cody Jackson	Cody Jackson	Packt Publishing, 2018, ISBN :9781789531947
2	Python Basics: A PracticalIntroduction to Python 3	David Amos, DanBader et. al.	Real Python, 2021 ISBN : 9781775093329
3	Introduction to Problem Solving with Python	E. Balagurusamy	Mc Graw Hill India, New Delhi, 2017ISBN: 9789352602582
4	Beginning Python	James Payne	Wiley, 2010 ISBN: 9780470414637
5	Think Python	Allen Downey	O'Reilly, USA, 2016, ISBN : 978-9352134755

SOFTWARE/LEARNING WEBSITES

- www.python.org
- www.learnpython.org
- www.hackr.io/tutorials/learn-python
- www.sololearn.com/learning/1073
- www.nptel.iitm.ac.in
- <https://docs.python.org/3/library/turtle.html>

Computer Hardware, Maintenance and Administration

Subject code – CSE302

1. Rationale

Professional computer maintenance ensures computer hardware and software systems run efficiently to increase productivity while lowering the chances of downtime. This course aims to help understand the internal working of computers/laptops and prepare the student for a role as an entry-level IT support technician. This course sets a basis for different facets of information technology like computer hardware, software, trouble shooting and customer service.

2. Course Outcomes: At the end of this course, students will be able to:

CO-01	Assemble a computer as per given technical specifications following all necessary safety protocols and install, configure and setup an administrator for a Windows Operating System.
CO-02	Diagnose a computer using the right diagnostic tools, identify the hardware problem and troubleshoot to resolve the problem following all safety protocols.
CO-03	Diagnose an installed software using the right diagnostic tools, identify the bug/issue, troubleshoot to resolve bugs/issues and ensure all data and applications are backed up before troubleshooting.
CO-04	Explain e-waste protocols to be followed while disposing computer hardware, to ensure compliance with all required state pollution control board regulations.

3. Course Content

Week	CO	PO	Lecture (Knowledge Criteria)	Tutorial (Activity Criteria)	Practice (Performance Criteria)
1	01	1, 4	I/O devices and Interfaces Types of I/O devices and ports on a standard PC for connecting I/O devices. Function of serial port, parallel port, and brief principle of communication through these ports, types of devices that can be connected and interface standards. Explain basic cable types, features and their purposes. Importance of USB and HDMI interfaces- Types and Features. Working of Common	Refer Table 1	1. Hardware Identification: <ul style="list-style-type: none">• Computer Case- Types, Features- Front panel, back panel; A look inside the computer case.• Identify the front and rear panel controls and ports on a PC cabinet.• Identify and understand different cables and connectors: Video cables- VGA, HDMI, Mini-HDMI, Display port, DVI; Peripheral cables- Serial; Hard drive cables- SATA, PATA, IDE,

			Input/Output devices- Keyboard, Mouse, display monitor, printer and speaker.		SCSI; Adapters-DVI to HDMI, USB to ethernet, DVI to VGA. <ul style="list-style-type: none"> • Installation of a local printer. • Shared printer. • Installing wireless and cloud printers.
2	01	1,4	Power supplies Safety Basics: safety protocols; anti-static basic hand tools, Know the danger of static electricity, power variation; Precautions to be taken while mounting and unmounting power supply into/ from the cabinet; DC power source to PC - Need for SMPS, Specifications, Rating of SMPS based on type of motherboard and devices used (AT/ATX, Micro ATX, mini ATX, higher wattage PSU for gaming PC), color coding adopted, Types of connectors used- ATX, ATX12V, Molex, SATA, PCIe; Output voltage levels, measuring technique; choosing power supply based on wattage rating; Heat sink; 80 plus rating system; Modular power supply. Symptoms of SMPS failure; Common problems from a faulty SMPS. Trouble shooting Power supplies.		<ol style="list-style-type: none"> 1. Unmount the power supply from PC cabinet. Identify the types of output connectors. 2. Identify output voltages using color coding. 3. Measure voltage levels using multi meter. 4. Mount the power supply into the PC cabinet, connect different components and test PC. 5. Trouble shoot Power supply through SMPS fan. 6. Diagnose power supply faults using PSU Tester.
3	1	1,4	Basic Electronics –Electricity, Electrical quantities- Voltage, current and resistance; Active components: Diodes- PN junction diodes, biasing conditions- forward bias and reverse bias, transistors- BJT, MOSFET; Passive components-Resistors, capacitors, inductors, transformers, sensors, and transducers; Integrated Circuits Digital Electronics- PWM, opto-coupler; checking AC to DC converter.		<ol style="list-style-type: none"> 1. Identify the electrical and electronic components used in a computer and tabulate them as active and passive components. 2. Identify the working and non-working state of basic components and semiconductor devices. 3. Using multi meter- Check Output voltage of basic components and semiconductor devices. 4. Check different voltage levels of opto-coupler, PWM and rectifier.
4	01,03	01,04	Mother board – Example Motherboards; Functional description of mother board; specification and variation. Form factor- what is Motherboard Form factor? Types and features of Motherboard form factors- ATX, Micro-ATX, Mini-ITX,		<ol style="list-style-type: none"> 1. Precautions to be taken before removing the mother board from PC cabinet. 2. Using the CPUID CPU-Z tool, find different features of CPU. 3. Check the Electric flow path and data flow path 4. Windows resource monitor

			Nano-ITX, and Pico-ITX. Functional components of Motherboard; CPU and CPU socket-Types of sockets; Overview of microarchitecture of INTEL and AMD CPU.		5. Using the CPUID CPU-Z tool, identify the CPU cache features of your working system.
5	01, 03	01, 04	Chipsets- Function, Types and Features. Buses- System bus architecture Importance of POST; UEFI – why is it required, possible configurations through UEFI. IDE ports; Methods of adding SCSI drives. CMOS battery: Why? Its specifications. Impact of removing the battery from mother board.		<ol style="list-style-type: none"> 1. Identify system faults using POST diagnostics card. 2. Understand basic onboard configuration through UEFI. 3. Test different motherboards to determine support for UEFI 4. Replace the CMOS battery in a computer following the procedures. 5. Understand and modify BIOS settings and observe the consequences of CMOS failure.
6	01, 03	01, 04	Memory– Memory Units (B, KB, MB, GB, TB), memory locations and address space, Access methods, Memory Classification. Main memory Types and Features. Auxiliary memory – Types and features. Memory modules.		<ol style="list-style-type: none"> 1. Identify RAM chips and HDD/SSD, study their features and note their technical specifications. 2. Identify SIMM and DIMM memory modules, their number of pins, specs and type. 3. Identify the interface type of a hard drive and connect it to a PC for data recovery.
7	01, 03	01, 04	RAM Technology- SDRAM, DDR, DDR2, DDR3, DDR4 – Clock speed, Bandwidth, Memory speed rating, PC speed rating; RAM capacity- single- sided and double-sided RAM, Channels; RAM features- Parity/ECC RAM, SODIMM, SPD chip. Mass storage media- Hard drive, Principle of working, reliability, performance, SSD, optical drive; Logical Block Addressing (LBA); Memory capacity- physical and logical addressing; M.2 drives, SATA, NVMe. Causes of Hard drive failure; Signs of failure; Backup and recovery of data;		<ol style="list-style-type: none"> 1. Use CPUID-CPUZ tool to identify capacity, speed, technology, and related features of RAM. 2. Check for RAM and Motherboard compatibility and install additional RAM stick. 3. Find on Windows system properties to check the RAM for correct installation. 4. Query the SPD RAM chip to identify all possible information using CPUID CPUZ.
8	02, 03		Windows Installation – Overview windows 10; general features; Versions; architecture; prerequisites for windows 10 installation: hardware compatibility, BIOS compatibility, driver requirements. Clean install of		<ol style="list-style-type: none"> 1. Windows Installation Inspect prerequisites for windows 10 installation on a given computer. 2. Perform clean installation. 3. Upgrade to windows 10. 4. Create dual boot for a given system, learn and rectify errors

			windows 10; upgrade to windows 10; disk partitioning; troubleshooting installation problems; Multiple boot options; windows service packs. Imaging: create a Windows system image; How to Backup/Restore your Windows partition with the bootable image.		in dual boot. 5. Practice on recovery partition. 6. Practice 10 registry tweaks. 7. Practice disk management utilities.
9	01, 02, 03		File system overview, types, properties, conversion from one filesystem to another, configuration. Configuring system and data recovery: Recover files, recover apps and the registry; recover windows 10. Configure and manage windows updates: auto/manually; testing and troubleshooting updates. Monitor and manage: Performance monitoring; optimize windows services; tune scheduled tasks. Customizing windows desktop.		1. Practice data recovery methods 2. Working with task manager to troubleshoot configuration and other performance related issues. 3. Working with task scheduler. 4. Customizing windows desktop.
10	01, 03	01, 04, 07	Windows Command line; PowerShell; basic commands; writing simple PowerShell scripts. File security.		1. Execute basic commands in Windows using command prompt and PowerShell like listing the drives in a system, creating a new file, removing a file or directory, retrieving the list of processes and services, etc., 2. Use command line to encrypt and decrypt files and folders.
11	02, 03, 04	01, 04	Portable computing- Troubleshooting Laptops- I Difference between laptop and desktop Motherboards; Checking Power connector and adaptor pins, AC adapter of Laptop circuit diagram, Fault finding; troubleshooting voltage transfer section, AC-DC conversion, Generation of stand by voltage, fault finding- No power ON, power switch, Battery charging circuit;		1. Observe the layout of a laptop and compare it with a desktop. 2. Follow/review manufacturer maintenance guide for repair and maintenance. 3. Power Issues: Battery not charging, No power. 4. Trouble shoot computer hardware issues in the following scenarios- -Unexpected shutdowns. -Lockups -POST & Boot -Continuous reboot -No Power -Loud Noises. -Intermittent device failure -Smoke and burning smell 5. -Indicator lights.

12	03, 04,	01, 04	Troubleshooting Laptops- II Dual MOSFET pin details, Two N- channel MOSFET in place of dual MOSFET, one p-channel and one N- channel MOSFET, problems and faultfinding; CPU voltage generation circuits, keyboard interface, problem and fault finding. Touch pad connector, BIOS details, SATA HDD details, Audio section, internal display, LED screen pin details. Malware mitigation: introduction, types, symptoms, malware removal;		1. Perform the same operations in week#7 on a laptop. 2. LCD display trouble-shoot: No display/dim video/flickering video. 3. Wireless troubleshooting: Multiple antennae, check presence of wireless cards. 4. Scan and remove malwares in each computer or mobile device. 5. Perform Antivirus and anti-malware updates.
13	04,	01, 04	E-waste management: What is EEE and E-waste? Different scenarios of E-waste management, StEP initiatives to solve e-waste problems, impact of e-waste on health of children and workers. E-waste management in India: EPR and e-waste, the informal sector in e-waste management, Technologies for e-waste management, Financing e-waste management systems- Key steps, milestones to achieve a robust E-waste system. Case studies.		<ul style="list-style-type: none"> Visit https://greene.gov.in and https://kspcb.karnataka.gov.in/ to find the latest regulations and policies taken up by the Government of India. Visit a nearby e-waste management plant and understand the management process.
Total in hours			39	13	52

*PO = Program outcome as listed and defined in year 1 curriculum

Table 1: Suggestive activities for tutorials (the list is only shared as an example and not inclusive of all possible activities for that course. Student and faculty are encouraged to choose activities that are relevant to the topic and the availability of such resources at their institution)

SL NO	Activity
1	1. Study multipurpose cables used with different models of computers and their applications. 2. Identify the cables and list the devices that can be connected to computer using these cables. 3. Identify commercially available brands of keyboard, mouse and monitor and their distinguishable features.
2	1. Identify preventive measures that help to eliminate or reduce electrostatic discharge. 2. Describe effective ways to reduce the risk of injury or damage while working with respect to power supply in computer systems. 3. Make your observations on why a technician may choose to use a UPS instead of a surge suppress or to protect a computer. 4. Identify the components that are powered by the PSU. 5. Identify the common causes of PSU/SMPS failure and explain how it can be maintained in a healthy state.

	6. Explain the factors on which the PSU wattage is decided. 7. Describe the features of different Power supplies available commercially that support a gaming PC.
3	1. Calculate the value of resistors onboard using the color code. 2. Identify the terminals of a BJT and MOSFET.
4	1. Identify the units MHz and GHz with respect to CPU. 2. Compare and contrast the characteristics of different motherboard form factors. 3. Identify and present the factors to select an appropriate Motherboard based on the purpose-Basic applications, Gaming, Workstations/servers. 4. Study the features and specifications of the processors (Intel: Pentium family, dual core, quad core, core 2 duo, i3, i5, i7, i9 and AMD processors). 5. Study the CPU benchmarks of the trending processors. 6. Compare features of CPU and GPU.
5	1. Explain bus standards with respect to evolution, speed, and recent trends (ISA, PCI, AGP). 2. Explain how to clear CMOS password. 3. Explain the importance of UEFI and configuration settings for – a Overclocking of CPU frequencies b Set RAM timings 4. Setting BIOS passwords Specify boot options.
6	1. Describe the classification of memories. 2. Study different types of memory devices and features that are commercially available.
7	1. Study the characteristics of different types of SSDs. 2. Compare DDR4 and DDR5 memory. 3. Study and identify what happens when the hard drive fails.
8	1. Identify system requirements for Windows 10 installation. 2. Study and list the features of different versions of windows 10. 3. Explore file backup in Windows file history feature.
9	1. Study best practices followed in scheduled backups and scheduled disk maintenance. 2. Study the necessity of TPM in Windows 11.
10	1. Compare relative merits and demerits of the two command shells.
11	1. Relate the components of a laptop to a desktop and compare their features. 2. Identify the upgradable and non- upgradable components in laptops.
12	1. Document the common faults that may occur on the motherboard.
13	1. Study the e-waste rules 2016 and their amendments there-off as prescribed by the Karnataka state pollution control board and explain the process for the polytechnic to follow safe disposal of e-waste. 2. Study the global e-waste key statistics. 3. Sketch the e-waste policies and regulations, you think, must be regulated at each stakeholder's level.

4. Reference:

Sl. No.	Description
1	https://www.dell.com/support/kbdoc/en-in/000139662/what-does-the-msconfig-utility-do-in-windows-7-on-your-dell-pc#TOC
2	https://www.google.co.in/amp/s/www.ufsexplorer.com/amp/articles/how-to/connect-sata-disks-instruction.php
3	http://www.qiguaninc.com/met/faq/faq35_en.html
4	https://www.ciscopress.com/articles/article.asp?p=2999386&seqNum=3
5	https://www.crucial.in/articles/pc-builders/what-is-computer-hardware
6	https://www.udemy.com
7	https://www.pluralsight.com

Computer Networks

Subject code – CSE303

1. Rationale

The computer networking skills are essential in today's information and communication technology driven world. It enables students with essential skills and knowledge to explore the world of communication and networking for further study and career.

2. Course Outcomes: At the end of the course, the student will be able to:

CO-01	Select an appropriate communication technology for a given network and ensure optimal performance by addressing issues arising from transmission impairments.
CO-02	Design a network for a given specification by using the right network components, devices, topologies, protocols and software.
CO-03	Design, build, test and troubleshoot a SOHO network for a given premises.
CO-04	Demonstrate the configuration of IP address, routing, subnetting, client-server interaction (TCP, UDP) and DNS for a given WAN network using a network simulator and troubleshoot common network issues

3. Course Content

Week	CO	PO	Lecture (Knowledge Criteria)	Tutorial (Activity Criteria)	Practice (Performance Criteria)
1	01	1, 2	Electromagnetic waves - Generation of electromagnetic waves and their properties Electromagnetic spectrum - classification and its applications Communication Systems - Basic elements of communication systems with block diagram, List commonly used terms in electronic communication systems, Data representation, Data flow, Modulation, Demodulation Analog and Digital Signals, Periodic and Non-Periodic Signals, Sine Wave, Phase, Wavelength, Digital Signals, Bit-rate, Bit-length.	Refer Table 1	1. Build a circuit to Generate and detect of BASK signal and BFSK signal using communication kit.
2	01	1,2	Transmission Impairment – Attenuation, Distortion and Noise,		1. Explore all ISP in your area/locality and select best internet ISP/plan

			<p>Performance - Bandwidth, Throughput, Latency, Jitter (Basic concepts only).</p> <p>Transmission Modes – Parallel and Serial Transmission. Asynchronous and Synchronous Transmission.</p> <p>Satellite communication- Introduction, advantages and disadvantages</p>		<p>based on cost and performance.</p> <p>2. Test the download/upload speed in your computer/mobile phone also check type, bandwidth and ISP.</p> <p>3. Explore Bluetooth, Wifi, NFC in your smartphone and note their key technical attributes (Radio spectrum band, range, pathloss, throughput, mode etc)</p>
3	01, 02	1, 2, 3	<p>Perspectives on Networking – End user perspectives on Networking and Internet, Overview of Networking. Categories of networks - LAN, MAN, WAN, Internetworking (Illustrate Network from LAN connected using a HUB to Internetwork).</p> <p>The communication rules (Method, language, Confirmation) – Protocols, the Internet.</p> <p>The Network Standard Organizations, Protocol Stack.</p> <p>OSI Model : OSI Layers and Their Functions, OSI Layering Concepts and Benefits, OSI Encapsulation Terminology.</p>		<p>1. My Protocol Rules Objectives</p> <p>a) Relate computer network protocols to the rules that you use every day for various forms of communication.</p> <p>b) Define the rules that govern how to communicate in a group of students.</p> <p>c) Play the communication game.</p> <p>d) List what would happen if the sender and receiver did not agree on the details of the protocol.</p> <p>2. Manual and Automatic address assignment (Windows)</p> <p>a) IPv4 address</p> <p>b) Subnet mask</p> <p>c) DNS</p> <p>3. Manual and Automatic address assignment (Android)</p> <p>a) IPv4 address</p> <p>b) Subnet mask</p> <p>c) DNS</p>
4	01, 02	1, 2, 3	<p>TCP/IP Networking Model - History Leading to TCP/IP, Overview of the TCP/IP Networking Model.</p> <p>TCP/IP Application Layer, HTTP Overview, HTTP Protocol Mechanisms.</p> <p>TCP/IP Transport Layer, TCP Error Recovery Basics, Same-Layer and Adjacent-Layer Interactions.</p> <p>TCP/IP Network Layer, Internet Protocol and the Postal Service, Internet Protocol Addressing Basics, IP Routing Basics.</p> <p>TCP/IP Link Layer (Data Link Plus Physical), TCP/IP Model and Terminology, Data</p>		<p>1. Organize and play games to understand working of TCP/IP like: Create 2 group of students, each playing role of a layers of TCP/IP (intermediate network devices roles can also be considered). Start the communication between two with a sender and receiver.</p> <p>2. Determine the IP Address Configuration of a</p>

			Encapsulation Terminology. Names of TCP/IP Messages.		Computer (Windows) and Test the Network Interface TCP/IP Stack (Ping).
5	02, 03	1, 2, 4,	Hardware and Software components of Network - Common network devices - Computers, Access points, Hub, Switch, Router, repeaters, NIC, Modem. LAN Cables – Co-axial, twisted pair, optical fibre, LAN connectors- co-axial cable, and twisted pair cable, optical fibre, Connectors, Firewall, Firm wares, ISPs.		1. Demonstrate working of common network devices. 2. Demonstrate different network cables and connectors. 3. Install and configure NIC. 4. Crimping of RJ45: Straight and Cross. a) Punching Cat 6 cable to I/O Box. Use punching tool. b) Check connectivity using LAN tester
6	01, 02	1, 2, 3, 4,	Overview of network topologies - Basic topologies- bus, ring, star, mesh and hybrid. Network Simulator: Network simulator like Packet Tracer, Installation, User Interface. Deploy devices and cables GUI and CLI Configuration. Configure end Devices		1. Install Network simulator like Cisco packet tracer. 2. Create simple network in simulator. 3. Create and Demonstrate all possible network topologies using simulator.
7	02, 03	1, 2, 3, 4,	An Overview of LANs - Typical SOHOLANs, Typical Enterprise LANs, The Variety of Ethernet Physical Layer Standards, Consistent Behaviour over All Links Using the Ethernet Data Link Layer. Building Physical Ethernet Networks with UTP - Transmitting Data Using Twisted Pairs, Breaking Down a UTP Ethernet Link, UTP Cabling Pinouts for 10BASE-T and 100BASE-T, Straight-Through Cable Pinout, Crossover Cable Pinout, Choosing the Right Cable Pinouts, UTP Cabling Pinouts for 1000BASE-T, Sending Data in Ethernet Networks.		1. Build a physical Ethernet LAN Network and demonstrate file sharing, printer sharing. 2. Install and configure wireless access point over the LAN. 3. Use pathping command to find actual path between source to destination with information about network latency/delay & network loss.
8	02, 03	1, 2, 3, 4,	Ethernet Data Link Protocols – The Rise of Ethernet, The Ethernet MAC address and Ethernet Addressing, Identifying Network Layer Protocols with the Ethernet Type Field, Error Detection with FCS. Encapsulation, Ethernet Frame. Hierarchical Network Design – Physical and logical addresses, Benefits of a Hierarchical Design, Access, Distribution, and Core layers Sending Ethernet Frames with Switches and Hubs, Sending in Modern Ethernet LANs Using Full-Duplex, Using Half-Duplex with LAN Hubs. Ethernet access layer devices – Hub, Switch, The MAC address table,		1. Determine the MAC Address of a Host(PC and Phone). 2. View Wireless and Wired NIC Information and make a table explaining each. 3. Configure and install a ethernet switch/Hub (Use simulator if hardware devices are not available) 4. Create/model a simple Ethernet network using 3 hosts and a switch, Observe traffic behavior on the network and Observer

			Ethernet Broadcast and Broadcast domain, ARP.		data flow of ARP broadcasts and pings.
9	02, 03, 04	1, 2, 3, 4,	<p>Routing: The Need for Routing - Criteria for Dividing the Local Network - Now We Need Routing</p> <p>Overview of Network Layer Functions - Network Layer Routing (Forwarding) Logic, Host Forwarding Logic: Send the Packet to the Default Router, Routing Data Across the Network, Delivering Data to the End Destination, How Network Layer Routing Uses LANs and WANs, IP Addressing and How Addressing Helps IP Routing, Routing Protocols.</p> <p>IPv4 Addressing - Rules for IP Addresses, Rules for Grouping IP Addresses, Class A, B, and C IP Networks, The Actual Class A, B, and C IP Networks, IP Subnetting, How to create subnets, Subnet mask, CIDR, variable length subnet mask.</p>		<p>1. Build a simple peer-to-peer network and verify physical connectivity and Assign various IPv4 addresses to hosts and observe the effects on network communication</p> <p>2. Configure IP addresses of a network (real or simulated) and ping across to test and troubleshoot.</p> <p>3. Subnetting of a network (either using real network or in Simulator).</p> <p>4. Connect to web server using simulator, Observe how packets are sent across the Internet using IP addresses.</p>
10	02, 03, 04	1, 2, 3, 4, 7	<p>IPv4 Routing - IPv4 Host Routing, Router, Forwarding Decisions and the IP Routing Table, The default gateway, A Summary of Router Forwarding Logic, A Detailed Routing Example.</p> <p>Routing Protocols - IPv4 Routing Protocols – static and dynamic.</p> <p>Other Network Layer Features - Using Names and the Domain Name System, The Address Resolution Protocol, ICMP Echo and the ping Command.</p> <p>DHCP – Static address assignment, Dynamic address assignment, DHCP servers.</p>		<p>1. Implement simple static routing.</p> <p>2. Troubleshooting of IP Addressing-</p> <p>a) Change a routing table entry</p> <p>b) Wrong address</p> <p>c) incorrect subnet mask</p> <p>3. Configure and test DHCP on a wireless router (real or simulated)</p>
11	02, 03, 04	1, 2, 3, 4,	<p>Pv4 and IPv6 Address Management - Network Boundaries -Gateways to Other Networks, Routers as Gateways.</p> <p>Network Address Translation - Introduction, NAT operation.</p> <p>IPv4 Issues - Need of IPv6, Ipv4 vs IPv6, IPv4 and IPv6 Coexistence.</p> <p>IPv6 features - IPv6 Address Representation.</p> <p>Concept of Virtual LAN's(VLAN's)</p>		<p>1. Packet Tracer - Examine NAT on a Wireless Router</p> <p>2. Identify IPv6 Addresses</p> <p>a) Identify the different types of IPv6 addresses.</p> <p>b) Examine a host IPv6 network interface and address.</p> <p>c) Practice IPv6 address abbreviation.</p> <p>3. Setup, configure and test VPN in your smartphone.</p>
12	02, 03, 04	1, 2, 3, 4,	<p>The Client Server relationship – Client Server interaction. URI, URN, URL</p> <p>TCP/IP Layer 4 Protocols: TCP and UDP - Transmission Control Protocol, Multiplexing Using TCP Port Numbers, Popular TCP/IP Applications, Connection Establishment and Termination, User Datagram Protocol.</p>		<p>1. Create a client – server model in simulator and observe the client interaction between the server and PC using packet tracer.</p> <p>2. Observe DNS Name Resolution</p>

			Port Numbers – TCP and UDP. Socket pairs, the netstat command. Application Layer Services - Common Network Application Services, Domain Name System, Domain Name Translation, DNS Servers, HTTP, Web Clients and Servers, FTP, Virtual Terminals, Remote Access with Telnet or SSH, Telnet, Security Issues with Telnet, SSH, Email- Email protocols, Simple Mail Transfer Protocol (SMTP), Post Office Protocol (POP3), Internet Message Access Protocol (IMAP4).		a) Observe the conversion of a URL to an IP address. b) Observe DNS lookup using the nslookup command. 3. Use simulator to demonstrate Telnet and SSH
13	02, 03, 04	1, 2, 3, 4,	Troubleshoot Common Network Problems - The Troubleshooting Process, Network Troubleshooting Overview, Gather Information - Nature of problem, Equipment, Configuration and Topology, Previous Troubleshooting. Structured Troubleshooting Methods - Bottom-Up, Top-Down, Divide-and-Conquer, Follow-the-Path, Substitution, Comparison, Educated Guess. Guidelines for Selecting a Troubleshooting Method Troubleshoot Wireless Issues - Causes of Wireless Issues, Authentication and Association Errors.		1. Demonstrate troubleshooting Commands with a scenario- ipconfig, ping , netstat, tracert, nslookup. 2. Interpret the output of commonly used network command line utilities and Determine which network utility can provide the necessary information to perform troubleshooting activities in a bottom-up troubleshooting strategy 3. Physical Layer Problems - Common Layer 1 Problems, how to use the five senses to troubleshoot, Wireless Router LEDs, Cabling Problems 4. Common Internet Connectivity Issues - DHCP Server Configuration Errors, Check Internet Configuration, Check Firewall Settings.
Total in hours			39	13	52

*PO = Program outcome as listed and defined in year 1 curriculum

Table 1: Suggestive activities for tutorials (the list is only shared as an example and not inclusive of all possible activities for that course. Student and faculty are encouraged to choose activities that are relevant to the topic and the availability of such resources at their institution)

Sl. No	Activity
1	Prepare a report on advanced communication systems and suggest best way to connect remote villages of India.
2	Prepare a report on Communication satellites of Indian Space Research Organization.
3	Prepare a presentation on 5 networking protocols being used in your smart phone.
4	My Protocol Rules Objectives a) Relate computer network protocols to the rules that you use every day for various forms of communication. b) Define the rules that govern how you send and interpret text messages.

	c) Explain what would happen if the sender and receiver did not agree on the details of the protocol.
5	My Local Network a) Record all the different network-attached devices in your home or classroom. b) Investigate how each device connects to the network to send and receive information. c) Create a diagram showing the topology of your network. d) Label each device with its function within the network.
6	Detailed study of Packet tracer and present the same.
7	Trace a Route a) Determine network connectivity to a destination host b) Trace a route to a remote server using tracert
8	Presentation on wireless Ethernet protocols
9	1. Calculate whether destination address is local or remote using IP address. 2. Calculate whether destination address is local or remote using mask. 3. Use logical AND to determine network address
10	Identify IPv6 Addresses a) Identify the different types of IPv6 addresses. b) Examine a host IPv6 network interface and address. c) Practice IPv6 address abbreviation.
11	Prepare a report on ICANN List the popular port numbers with their use.
12	Prepare a report on popular application layer protocols and present the same.
13	Identify and correct any misconfiguration of a wireless device (Scenario : A small business owner learns that a wireless user is unable to access the network. All the PCs are configured with static IP addressing. Identify and resolve the issue)

4. Reference:

Sl. No.	Description
1	www.netcad.com
2	Computer Networks - Behrouz A. Forouzan
3	www.howtonetwork.com
4	vlab.co.in

Database System Concepts and PL/SQL

Subject code – CSE304

1. Rationale

Data, factual information, is the main driving force that is changing the face of our world. Database is an organized collection of related data which is stored and accessed electronically using a computer. Database management has evolved from a specialized computer application to a central component of virtually all enterprises, and, as a result, knowledge about database systems has become an essential part of an education in computer science. SQL is a powerful language for both querying and updating data in relational databases. Study of SQL empowers students to implement and work with relational data model.

2. Course Outcomes: At the end of the course, the student will be able to:

CO-01	Identify the elements of ER model for a given requirement, draw ER diagram and validate with the given requirement.
CO-02	Translate the given ER diagram to a relational model and verify against integrity constraints. Also refine and normalize the relational database design against first three normal forms.
CO-03	Use appropriate SQL statements to create a database and other DB objects using a DBMS software.
CO-04	Perform insert, delete and/or update operations on the database and query the database to retrieve the required information using appropriate SQL statements and clauses.

3. Course Content

Week	CO	PO	Lecture (Knowledge Criteria)	Tutorial (Activity Criteria)	Practice (Performance Criteria)
1	1	1,4	Introduction Overview of DB: why a database? Purpose of database; Classification; Application; DBMS: features, providers; Functional components of DBMS; Types of DBMS architecture; View of data in DBMS; Database users; Role and responsibilities of DBA; Case study: Example of any database application, recruitment database	Refer Table 1	1. Install and setup DBMS software such as MySQL, PostgreSQL 2. Learn the interface and explore the features of installed DBMS
2	1	1,3,4	Database design Data model; types; importance of data modeling; Overview of database design; phases		1. Identify and ER-model elements and draw ER

			of database design; database development life cycle; Conceptual design: ER-Model: entity: types; attribute: types; relationships: types, constraints, Symbols and Notations; Case study: conceptual design for a set of specifications <ul style="list-style-type: none"> i. Restaurant ii. Retail shop iii. Recruitment iv. College v. Library 		diagram for the given specifications using tools.
3	2	1,3	Relational model: Overview; characteristics; Constraints: types; Operations; Advantages and Disadvantages; applications; Design anomalies; Features of good DB design;		<ol style="list-style-type: none"> 1. Map ER Model to relational model 2. Identify various constraints
4	2	1,3	Functional dependency: overview, rules, types; Normalization: normalization process; importance of normalization; 1NF, 2NF, 3NF Sufficient examples to understand the concept		<ol style="list-style-type: none"> 1. Normalize the above design
5	3	1,4	database languages: types, commands/tasks in each type; Integrity constraints; MySQL/PostgreSQL: overview; features; datatypes; Standardization guidelines;		<ol style="list-style-type: none"> 1. Validate the above design against integrity constraints
6	3	1,3,4	Defining Data: DDL CREATE, ALTER, DROP different DB objects; Temporary tables: types, create and use; external tables; Managing constraints		<ol style="list-style-type: none"> 1. Use MySQL/PostgreSQL DDL statements to create database and other DB objects for above design
7	3,4	1,3,4	Insert, delete and update data Modifying data: UPDATE and DELETE Update anomalies; impact of constraints Querying of available data: SELECT; Aliases; sorting data: ORDER BY		<ol style="list-style-type: none"> 1. Perform single table and multi table insertion 2. Perform delete and update operations 3. Querying single table 4. Sort the result set of a query
8	4	1,4	filtering data: WHERE, AND, OR, row limiting clause, IN, BETWEEN, LIKE; Joining table: INNER JOIN, LEFT JOIN,		<ol style="list-style-type: none"> 1. Querying single table 2. Filtering data 3. query multiple tables with joins
9	4	1,4	Grouping data: Aggregate functions, GROUP BY, HAVING; Set operators: UNION, INTERSECT, MINUS;		<ol style="list-style-type: none"> 1. Queries that use set operators 2. Report aggregated data using group functions
10	4	1,4	Subqueries: Comparator operators; subqueries: Single Row Subqueries; Multiple Row Subqueries; correlated subqueries; EXISTS, NOT EXISTS, ANY, ALL, SOME;		<ol style="list-style-type: none"> 1. Write sub queries to retrieve information from the created database
11	4	1,4	Views: create, drop and update; realization of views based on single and multiple tables;		<ol style="list-style-type: none"> 1. Create view and query

			DCL: Controlling user access: Differentiating system privileges from object privileges; Granting privileges on tables		2. Create users and assign privileges for DB operations
12	4	1,4	PL/SQL: variables, datatypes; control statements (decision making); Stored procedures and Functions Concept; syntax and structure of store procedure; syntax and structure of functions; calling a function; Examples;		1. Create and execute store procedures 2. Create and execute functions
13	4	1,4	Managing and controlling transactions: Introduction of transaction, ACID properties; states of transaction; Transaction control; Overview of transaction management, using transaction control commands: COMMIT, ROLLBACK, SAVE POINT, SET TRANSACTION; sufficient examples;		1. Create and execute transactions 2. Call previously created store procedure or function in transaction
Total in hours			39	13	52

***PO = Program outcome as listed and defined in year 1 curriculum**

Table 1: Suggestive activities for tutorials (the list is only shared as an example and not inclusive of all possible activities for that course. Student and faculty are encouraged to choose activities that are relevant to the topic and the availability of such resources at their institution)

1	1. Identify the drawbacks of file system and how DB enables us to overcome them. Identify distinguishable features of each of DBMS available in the market.
2	1. Transform given n-ary relationship to binary relationship 2. Document the steps to create ER diagram. 3. Identify the components of ER model in the given requirements.
3	1. Document the steps to create logical design 2. Discuss and document Codd's 12 rules
4	1. Explore and document other normal forms
5	1. study and present the working of SQL optimizer 2. Learn and report optimization techniques
6	1. Learn and demonstrate use of DISTINCT, ALL, IS NULL; 2. Learn and present RIGHT JOIN;
7	1. Identify the advantages of Cascading Referential Integrity Constraints
8	1. Identify need of subqueries
9	1. identify the advantages and disadvantages of store procedure and functions,
10	1. presentation on the latest developments in research and industry related to this course
11	1. Learn and present need of scalar subqueries
12	1. Learn iterative statements in PL/SQL

13	1. Does Relational model support storage of unstructured data, if no, what are the alternatives to store unstructured data.
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4. Reference:

Sl. No.	Description
1	Database System Concepts by Abraham Silberschatz, Henry F. Korth, S . Sudarshan
2	https://binaryterms.com/
3	https://beginnersbook.com/
4	https://www.oracletutorial.com/

5. Equipment/software list

Sl. No.	Particulars	Specification	Quantity
1	Computers		20
2	MySQL workbench/ or equivalent software; Lucid chart, draw.io		