Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Empowered Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
Hingna Road, Wanadongri, Nagpur - 441 110
NAAC A++
Ph.: 07104-237919, 234623, 329249, 329250 Fax: 07104-232376, Website: www.ycce.edu

Department of Computer Science & Engineering (IOT)

Vision of the Department

To be a well-known centre for pursuing computer education through innovative pedagogy, value-based education and industry collaboration.

Mission of the Department

To establish learning ambience for ushering in computer engineering professionals in core and multidisciplinary area by developing Problem-solving skills through emerging technologies.

Session 2025-2026

Vision: Dream of where you want.	**Mission:** Means to achieve Vision

Program Educational Objectives of the program (PEO): (broad statements that describe the professional and career accomplishments)

PEO1	**Preparation**	**P: Preparation**	**Pep-CL abbreviation pronounce as Pep-si-lL easy to recall**
PEO2	**Core Competence**	**E: Environment (Learning Environment)**	
PEO3	**Breadth**	**P: Professionalism**	
PEO4	**Professionalism**	**C: Core Competence**	
PEO5	**Learning Environment**	**L: Breadth (Learning in diverse areas)**	

Program Outcomes (PO): (statements that describe what a student should be able to do and know by the end of a program)

Keywords of POs:
Engineering knowledge, Problem analysis, Design/development of solutions, Conduct Investigations of Complex Problems, Engineering Tool Usage, The Engineer and The World, Ethics, Individual and Collaborative Team work, Communication, Project Management and Finance, Life-Long Learning

PSO Keywords: Cutting edge technologies, Research

"I am an engineer, and I know how to apply engineering knowledge to investigate, analyse and design solutions to complex problems using tools for entire world following all ethics in a collaborative way with proper management skills throughout my life." *to contribute to the development of cutting-edge technologies and Research*.

Integrity: I will adhere to the Laboratory Code of Conduct and ethics in its entirety.

Name and Signature of Student and Date
Bhushan Tayade
22-07-2025

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Empowered Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
Hingna Road, Wanadongri, Nagpur - 441 110
NAAC A++
Ph.: 07104-237919, 234623, 329249, 329250 Fax: 07104-232376, Website: www.ycce.edu

Department of Computer Science & Engineering (IOT)

Vision of the Department

To be a well-known centre for pursuing computer education through innovative pedagogy, value-based education and industry collaboration.

Mission of the Department

To establish learning ambience for ushering in computer engineering professionals in core and multidisciplinary area by developing Problem-solving skills through emerging technologies.

Session	**2025-26 (ODD)**	**Course Name**	**PE-I - Geo-Intelligence for Smart IoT Devices Lab**
Semester	**5**	**Course Code**	**23IOT1523**
Roll No	**035**	**Name of Student**	**Bhushan V. Tayade**

Practical Number	1
Course Outcome	Apply and demonstrate the use of proprietary and open-source GIS tools (e.g., QGIS) for creating, visualizing, and managing spatial datasets.
Aim	Install/verify QGIS, explore interface, and understand open-source vs proprietary GIS features.
Problem Definition	To install and verify QGIS on a computer system, explore its user interface to become familiar with the essential tools, and understand the differences between open-source GIS software and proprietary GIS platforms. (Discuss about 15 open source and proprietary software).
Theory (100 words)	15 Open-Source GIS Software & Their Features 1. QGIS (Quantum GIS) • Friendly desktop interface, supports Windows/Mac/Linux. • Wide file-format support: shapefiles, GeoJSON, KML, etc. • Rich plugin ecosystem for added functionality. • Cartographic styling, 3D views and integration with other open tools. 2. GRASS GIS (Geographic Resources Analysis Support System) • Strong for raster/vector data manipulation, time-series and spatio-temporal modelling. • 350+ modules for geospatial analysis. • Works on multiple OS and supports scripting (Python/Bash). 3. SAGA GIS (System for Automated Geoscientific Analyses) • Focused on terrain/hydrology analyses, advanced raster processing.

- Modular toolset, GUI + command-line options.
- Good cross-platform compatibility.

4. gvSIG
   - Desktop + mobile versions.
   - Integrates remote sensing, offers CAD-like vector editing, 3D visualisation.
   - Multilingual support.

5. uDig (User-friendly Desktop Internet GIS)
   - Java-based GIS platform.
   - Plugin-extendable, designed for web services (WMS/WFS) and database integration.

6. GeoServer
   - Web server for spatial data publishing; supports OGC standards: WMS/WFS/WCS.
   - Web interface for admin + support of many formats.

7. OpenLayers
   - JavaScript library for web GIS applications—vector + raster layers.
   - Integrates WMS/WMTS/OSM data sources; mobile friendly.

8. Leaflet
   - Lightweight JS library for web mapping.
   - Simple API, strong plugin ecosystem, works very well with OpenStreetMap.

9. PostGIS
   - Spatial extension for PostgreSQL database.
   - Supports spatial queries, raster/vector/topology data, integrates with other GIS tools.

10. GeoTools
    - Java toolkit/library for building GIS applications; implements OGC specs.
    - Useful for developers building customised GIS solutions.

11. ILWIS (Integrated Land & Water Information System)

- Supports image, vector and thematic data; older open-source GIS still in use.

12. MapWindow GIS
    - Free/open desktop GIS application plus programming component.

13. GeoNode
    - Web platform for managing and publishing geospatial data.
    - Supports collaborative mapping, metadata and data sharing.

14. Mundi
    - Emerging open-source web GIS combining vector/raster uploads and integration with LLMs.
    - Good for web & modern mapping workflows.

15. CesiumJS
    - Open-source 3D geospatial visualization engine for web (massive datasets, 3D city/terrain).
    - While more niche, increasingly relevant for 2025 workflows (3D web mapping).

---

15 Licensed / Commercial GIS Software & Their Features

1. ArcGIS Pro (by Esri)
    - Professional desktop GIS: 2D & 3D visualisation, advanced spatial analysis, integrates with ArcGIS Online/Enterprise.
    - Python scripting (ArcPy), comprehensive toolset.

2. ArcMap (ArcGIS Desktop by Esri)
    - Legacy desktop GIS widely used; strong cartography/layout tools, raster/vector format support.

3. MapInfo Professional (by Precisely)
    - Mapping & spatial analysis for business users; good thematic mapping, spatial SQL, scripting support.

4. AutoCAD Map 3D (by Autodesk)
    - Combines CAD + GIS: supports spatial databases, data linking/attributes, used in engineering/infrastructure.

5. ERDAS IMAGINE (by Hexagon Geospatial)

- Specialised in remote sensing/image processing: classification, change detection, LiDAR/photogrammetry support.

6. ENVI (by L3Harris Geospatial)
   - Advanced image processing & remote sensing: spectral analysis, supports UAV/satellite imagery, machine-learning tools.

7. Bentley Map (by Bentley Systems)
   - GIS for infrastructure asset management: GIS + CAD integration, 3D modelling and analysis, used in utilities/transport.

8. Smallworld GIS (by GE Digital)
   - Enterprise GIS for utility/telecommunications: strong data modelling, large datasets, business/operational systems integration.

9. Manifold System (by Manifold Software Limited)
   - High-performance GIS with GPU acceleration, spatial SQL support, handles large datasets efficiently.

10. Global Mapper (by Blue Marble)
    - Versatile GIS/Mapping tool: supports 300+ spatial formats, strong terrain/point-cloud capabilities, good value in commercial category.

11. Surfer (by Golden Software)
    - Focused on scientific/engineering mapping: contour mapping, 3D surface/volume modelling.

12. GISBox
    - Emerging commercial GIS platform combining mapping, 3D, AI integration, modern interface (2025 feature set).

13. CityEngine (by Esri)
    - 3D city modelling software: procedural modelling of urban environments, integrations for large–scale 3D GIS.

14. Maptitude

	• Desktop GIS for market and demographic analysis: maps + analytics oriented for business use. 15. CARTO • Cloud-based GIS/Location Intelligence platform: interactive maps, spatial data science, for policy/market analysis.
Procedure and Execution (100 Words)	Implementation Steps: -
	Stepwise Screenshots with steps: -
Output Analysis	To explore Geographic Information System (GIS) applications, QGIS serves as an excellent starting point since it is a widely used open-source platform known for its intuitive design and robust mapping capabilities. By working through its interface, users can practically learn how to manage layers, customize map symbology, and perform various geoprocessing tasks. In comparison with proprietary GIS options such as ArcGIS Pro or MapInfo, QGIS provides comparable analytical functions at no licensing expense. Nonetheless, commercial GIS software tends to deliver enhanced enterprise integration, advanced automation workflows, and specialized solutions for specific industries.
Link of student GitHub profile where lab assignment has been uploaded	"https://github.com/Bhushan-Tayade/YCCN-23071391.git"
Conclusion	The installation and verification of QGIS were completed successfully. Through exploring its interface, the core features of this open-source GIS platform were understood, including its mapping tools, symbology, and data management functions. The activity also helped in comparing open-source and proprietary GIS software, highlighting that while QGIS offers powerful and cost-effective capabilities, proprietary tools such as ArcGIS provide enhanced enterprise integration and advanced automation. Overall, the task was performed successfully.

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Empowered Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
Hingna Road, Wanadongri, Nagpur - 441 110
NAAC A++
Ph.: 07104-237919, 234623, 329249, 329250 Fax: 07104-232376, Website: www.ycce.edu

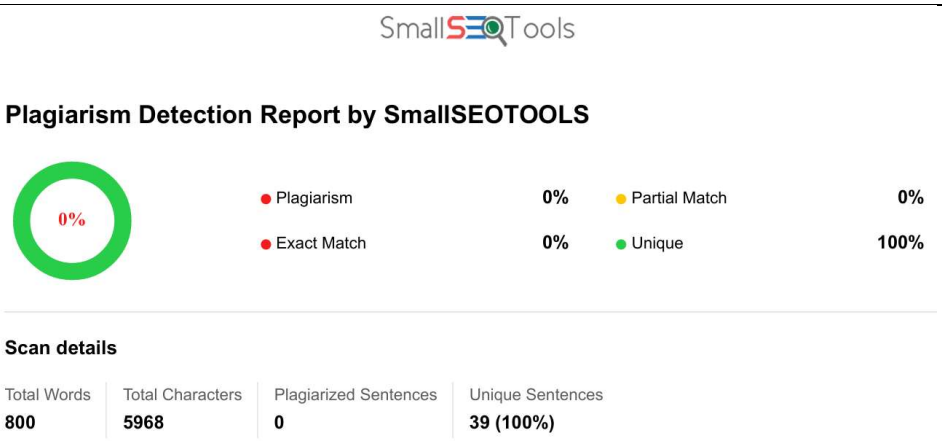
Department of Computer Science & Engineering (IOT)

Vision of the Department

To be a well-known centre for pursuing computer education through innovative pedagogy, value-based education and industry collaboration.

Mission of the Department

To establish learning ambience for ushering in computer engineering professionals in core and multidisciplinary area by developing Problem-solving skills through emerging technologies.

Plag Report (Similarity index <=12%)	
Date	22-07-2025