

# **GROUND CONTROL STATION FOR CANSAT**

**A Dissertation submitted in partial fulfilment of the requirements for the award of**

**Degree of**

**BACHELOR OF COMPUTER APPLICATIONS**

**OF**

**SRINIVAS UNIVERSITY**



**BY**

**NAME: HEMANTH M**

**USN: 3SU22BC003**

**UNDER THE GUIDANCE OF**

**DR MANJULA C M PRASAD**

**Professor and Head Academics**

**Institute of Computer Science & Information Science**

**Koramangala, Bangalore-560095**

**MAY 2025**

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**Name: Dr Manjula C M Prasad**

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**Institute of Computer Science & Information Science**

**Koramangala, Bangalore-560095**

**MAY 2025**

# **SRINIVAS UNIVERSITY**

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## **CERTIFICATE**

This is to Certify that **Hemanth M** bearing **USN 3SU22BC003** has completed his final semester Project Work entitled “**Ground Control Station for Cansat**” as a partial fulfilment for the award of **Bachelor of Computer Applications** degree, during the academic year 2025 under my supervision.

**Signature of Internal Guide**

**Guide Name: Dr Manjula C M Prasad**

**Designation: Professor and Head Academics  
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**Signature of External Guide**

**Guide Name: Ashwin Reddy**

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**Head of Department**

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## **DECLARATION**

I **Hemanth M**, the student of BCA-VI, of Institute of Computer Science and Information Science, bearing **USN 3SU22BC003** hereby declare that the project entitled “**Ground Control Station for Cansat**” has been carried out by me under the supervision of Internal guide **Dr Manjula C M Prasad , Professor and Head Academics** and submitted in partial fulfilment of the requirements for the award of the Degree of Bachelor of Computer Applications by the **Srinivas University** during the academic year 2025. This report has not been submitted to any other Organization/ University for any award of degree or certificate.

**Signature:**

**Name: Hemanth M**

**USN: 3SU22BC003**

## ACKNOWLEDGEMENT

I avail this opportunity to express my profound sense of sincere and deep gratitude to all those who have contributed to the knowledge and experience that I have gained during my project work.

To begin with, I would like to express my heartfelt thanks and regards to **Madam Smt. Padmini Kumar**, Resident Director and governing body member of Srinivas University, Bangalore for providing me an opportunity to take up this project.

I would like to express my heartfelt gratitude to **Dr. Adithya Kumar Maiya Sir**, Registrar, Academics & Development, Srinivas University and **Smt. Deepika Madam**, Management representative of Srinivas University, for providing me an opportunity to take up this project.

I would also like to express my heartfelt thanks and regards to **Dr. S.K. Prasad**, Dean, Srinivas University, Bangalore for providing me an opportunity to take up this project.

I would also like to express my sincere and grateful thanks to **Dr. Manjula C M Prasad**, Professor and Head Academics, Institute of Computer Science and Information Science, Srinivas University, Bangalore for her overwhelming support in my project.

I extend my profound gratitude to the Internal Project Guide, **Dr. Manjula C M Prasad**, Professor & Head Academics, Bangalore, for her valuable guidance, co-operation and suggestions & encouragement to complete this project.

I also wish to thank all the staff members, non-teaching staff members of the Institute of Computer Science and Information Science who have helped me directly or indirectly in the completion of this Project successfully.

Finally, but not least, I would like to thank my parents and friends for all their support and encouragement during my project work

**HEMANTH M**

# ABSTRACT

The Ground Control Station for CanSat is an interactive, full-stack web application designed to provide real-time monitoring, control, and analysis of telemetry data transmitted by a CanSat payload. This system allows authenticated users to securely log in and observe live environmental data such as temperature, pressure, altitude, latitude, and longitude—streamed via WebSockets and displayed through dynamic charts, maps, and tables in an intuitive dashboard interface.

Developed using React for the frontend and Node.js with Express for the backend, the application leverages PostgreSQL for data persistence and Sequelize ORM for schema management. Real-time telemetry is handled through Socket.IO, offering seamless and low-latency updates to the user interface. The authentication system includes JWT-based token sessions and Two-Factor Authentication (TOTP) via Google Authenticator, ensuring secure user access and role-based functionality for admins, operators, and viewers.

To enhance user experience, the system includes advanced features such as dark mode toggling, date/time range filtering, telemetry sorting, CSV exports, and alert notifications. Data visualizations such as line graphs, speedometer-style gauges, and geolocation mapping provide users with contextual insights into CanSat performance. Admin users have additional capabilities to manage user roles and monitor system usage through dedicated control panels.

Built with scalability and future-proofing in mind, the system supports modular upgrades such as CanSat command transmission, offline data analysis, and historical session playback. Future enhancements may include integration with machine learning models for anomaly detection, support for multiple CanSat devices, and cloud deployment for mission-critical use.

Overall, the Ground Control Station for CanSat demonstrates the convergence of aerospace engineering, real-time web technologies, and data analytics. It serves as a practical, educational tool for understanding telemetry systems, full-stack development, and real-time communication in small satellite missions.

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