FACULTY ENHANCEMENT PROGRAMME

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Date of Event: 25 September, 2025

Faculty-in-Charge: Ms. Gigy Johnson

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REPORT

As part of Faculty Enhancement Programme, a session was conducted on 25 September 2025 at the Seminar Hall, Main Block, from 3:15 p.m. to 4:00 p.m. The paper was presented by Mr. Deny P. Francis, Assistant Professor, Department of Computer Science, on the topic "GPS Demystified". The session had the participation of 45 faculty members from various departments. The presentation provided an overview of Global Positioning System (GPS), explaining its functioning and applications in a clear and accessible manner. The session was interactive, with participants engaging through questions and answers, contributing to a meaningful exchange of ideas.

Prepared by:	Verified by:	Approved by:
Ms. Gigy Johnson	Dr. Sabu Varghese	Rev. Fr. Dr. Paulachan K.J.
FEP Coordinator	Director IT/ HRD Cell	Principal

BROCHURE

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FACULTY ENHANCEMENT PROGRAMME



Mr. Deny P Francis
Asst. Professor
Department of Computer Science

Topic : GPS Demystified

DATE : 25 SEPTEMBER, 2025
TIME : 03.15-04.00 PM
VENUE : MAIN BLOCK,
SEMINAR HALL

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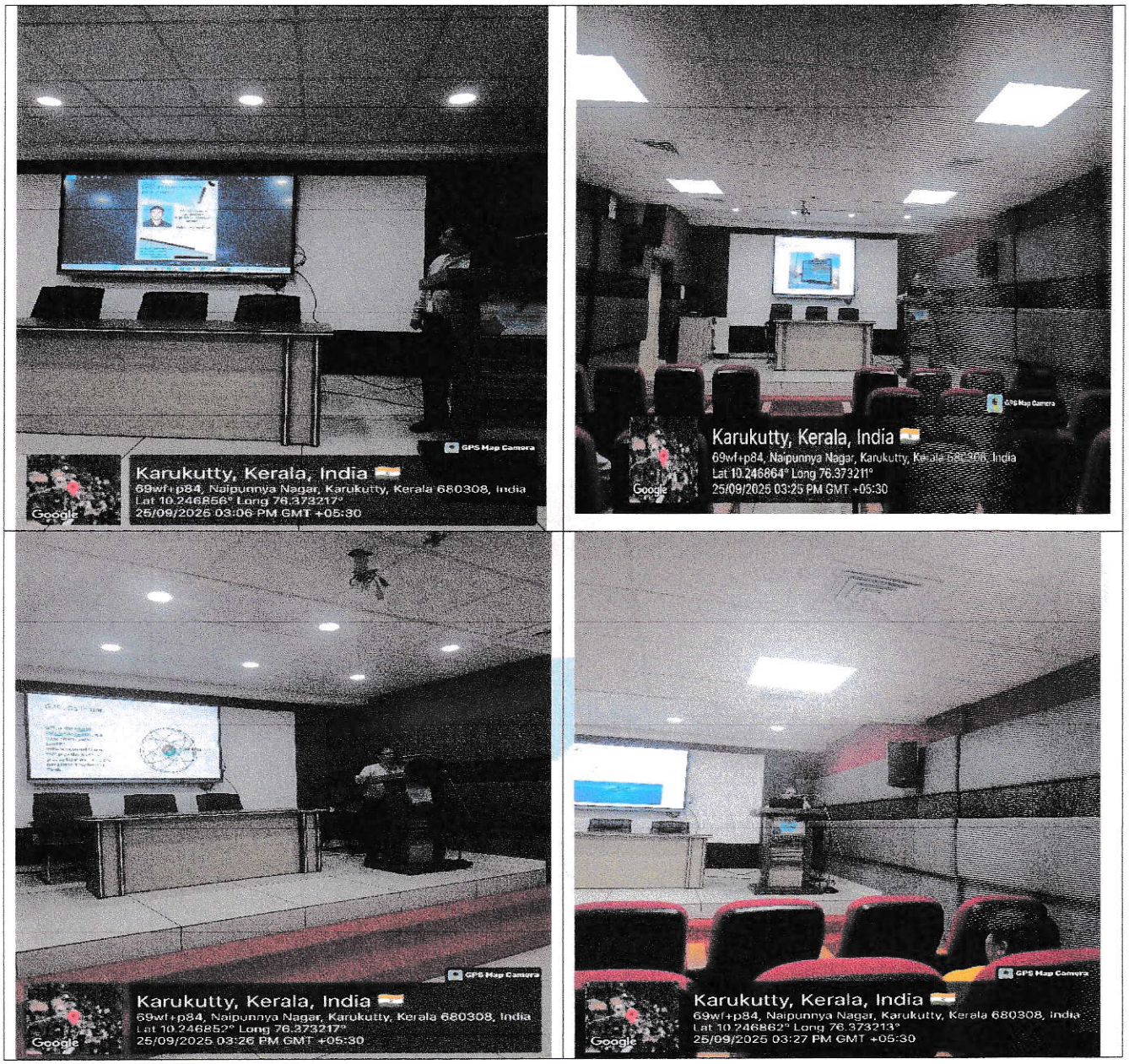
PHOTOGRAPHS



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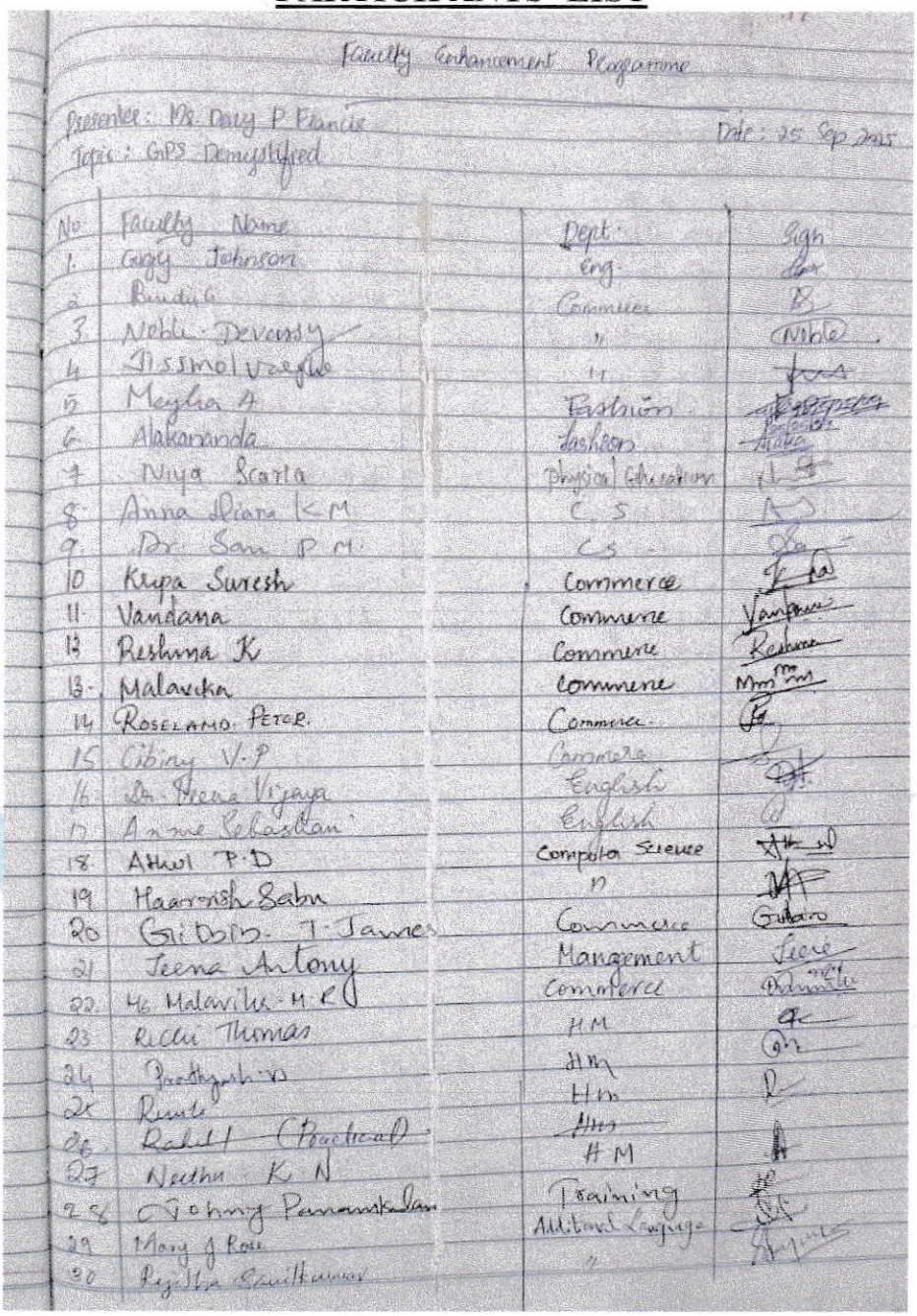
PARTICIPANTS' LIST



Faculty Enhancement Programme

Presenter: Mr. Dony P Francis
Topic: GPS Demystified
Date: 25 Sep 2025

No	Faculty Name	Dept.	Sign
1.	Gogy Johnson	Eng.	[illegible]
2	Bindu G	Commerce	[illegible]
3	Noble Devassy	"	Noble
4	Jissmol Varghe	"	[illegible]
5	Meyha A	Fashion	[illegible]
6	Alakananda	Fashion	[illegible]
7	Niya Scaria	Physical Education	[illegible]
8	Anna Diana K M	C S	[illegible]
9	Dr. Sam P M	CS	[illegible]
10	Kripa Suresh	Commerce	[illegible]
11	Vandana	Commerce	Vandana
12	Reshma K	Commerce	Reshma
13	Malavika	Commerce	[illegible]
14	Roselamd Peter	Commerce	[illegible]
15	Cibiny V.P	Commerce	[illegible]
16	Dr. Veena Vijaya	English	[illegible]
17	Anne Sebastian	English	[illegible]
18	Athul P.D	Computer Science	[illegible]
19	Haarrish Sabu	"	[illegible]
20	Gibbin T James	Commerce	[illegible]
21	Teena Antony	Management	Teena
22	Ms Malavika M R	Commerce	[illegible]
23	Ricci Thomas	HM	[illegible]
24	Prathyushan	HM	[illegible]
25	Rinu	HM	[illegible]
26	~~Rahul (Practical)~~	~~HM~~	[illegible]
27	Neetha K N	HM	[illegible]
28	Johny Panamkulam	Training	[illegible]
29	Mary J Rose	Additional Language	[illegible]
30	Rajitha Sasikumar	"	[illegible]

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No.	Faculty Name	Dept.	Sign.
31	Dr. SONIA S	Additional Languages	
32	Neethu Velu	"	
33	Aswathi M R	CS	
34	Jesseena Joy	CS	
35	Dharmajadas K.G	Commerce	
36	~~Joseph~~	Commerce	
37	Dr. Fairoz Ashraff	Commerce	
38	Jayakrishnan S	CS	
39	Kavitha Vincent	Commerce	
40	Neenu Thomas	CS	
41	Joseph James	Commerce	
42	Stimphy Mavon	CS	
43	Livin P Wilson	CS	
44	Shajitha T.B	CS	
45	Reni V Kalayil	MSW	

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GPS Demystified

Mr. Deny P Francis
Assistant Professor
Department of CS
Naipunnya Institute of Management and Information Technology

Abstract

The Global Positioning System (GPS) is a government owned navigation system to know the precise location and timing information worldwide. This is done with help of constellation of satellites, GPS receiver and Ground station. Initially it was developed for military purposes by the United States Department of Defense, GPS has become an essential tool in various civilian applications, including navigation, surveying, and communication systems. This paper reviews the architecture, working principles, applications, advantages, and limitations of GPS technology. The generic name for GPS is GNSS ('Global Navigation Satellite System'). The GPS is the GNSS of USA.

Index Terms

GPS, GNSS, Trilateration, Satellite Navigation, Positioning System

I. Introduction

The Global Positioning System (GPS) is a space-based navigation system consisting of a network of satellites that transmit signals to receivers on Earth. These signals enable users to determine their precise position, velocity, and time anywhere on the planet [1].

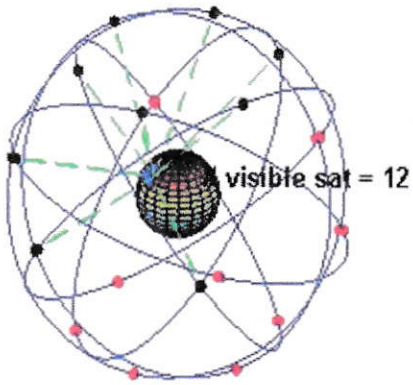
GPS operates continuously under all weather conditions and plays a vital role in modern infrastructure, from transportation to telecommunications [2].

II. GPS Architecture

A. Space Segment



The space segment consists of a constellation of at least 24 operational satellites orbiting the Earth at an altitude of approximately 20,200 km. These satellites continuously broadcast signals containing their position and precise time [3].

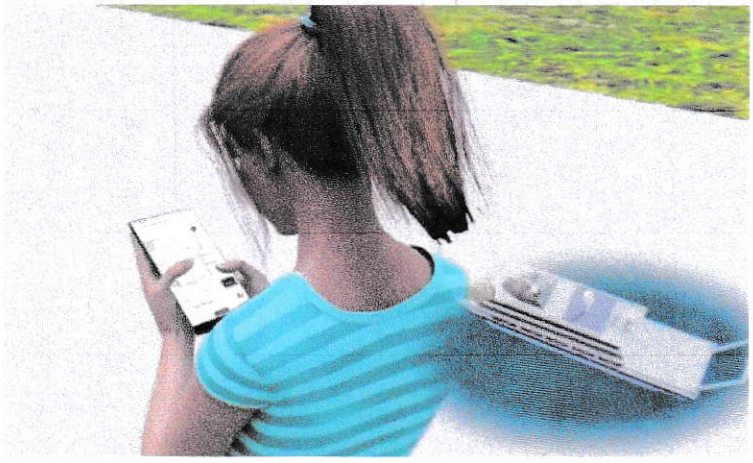


B. Control Segment

The control segment includes ground-based monitoring stations that track satellite positions, correct orbital errors, and synchronize satellite clocks. This ensures the accuracy and reliability of the system [4].

C. User Segment

The user segment comprises GPS receivers such as smartphones, navigation devices, and embedded systems. These receivers process satellite signals to compute position and time [1].



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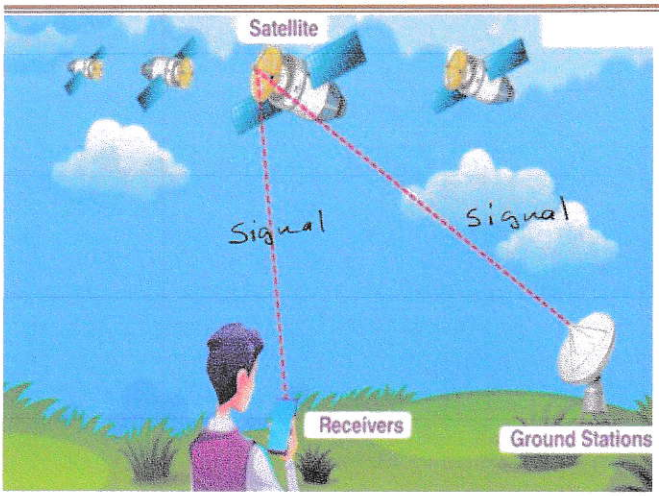
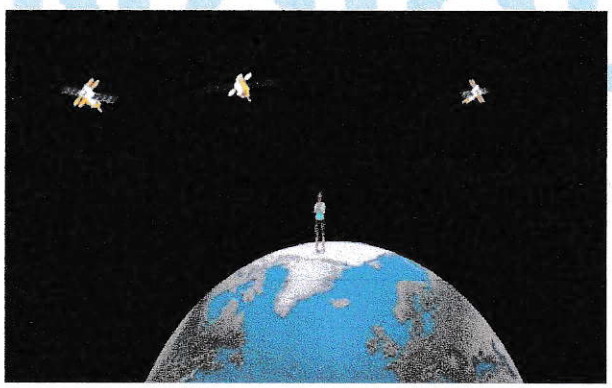


III. Working Principle of GPS

A. Trilateration

GPS determines position using Trilateration, which involves measuring distances from multiple to be exact three satellites.



A GPS receiver requires signals from at least four satellites to determine its three-dimensional position and clock error. The distance to each satellite is calculated using the travel time of the signal:

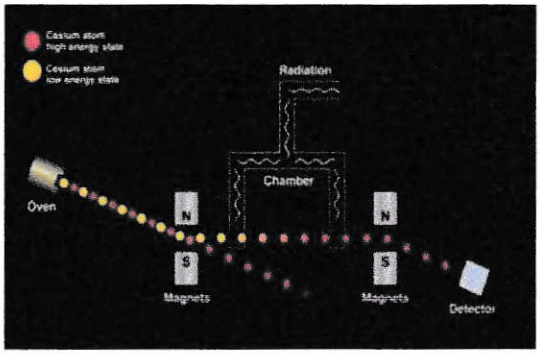
$$\text{Distance} = \text{Speed of Light} \text{Time Delay}$$



By solving multiple equations simultaneously, the receiver computes latitude, longitude, and altitude [4].

B. Atomic Clocks

Each GPS satellite is equipped with highly accurate atomic clocks. Precise timing is essential because even a small timing error can lead to significant positional inaccuracies [3].



C. Signal Transmission

GPS satellites transmit signals using radio frequencies. These signals include satellite position (ephemeris data), status, and precise timing information. Signal propagation can be affected by ionospheric and tropospheric delays [1].

IV. Applications of GPS

A. Navigation

GPS is widely used in road, air, and marine navigation systems, enabling real-time route guidance.

B. Surveying and Mapping

High-precision GPS is used in geodesy, land surveying, and geographic information systems.

C. Military Applications

GPS is used in missile guidance, troop navigation, and reconnaissance operations [2].

D. Timing Applications

GPS provides precise timing for financial systems, power grids, and communication networks.

E. Tracking Systems

GPS is used for tracking vehicles, assets, and individuals in logistics and security applications.

V. Advantages of GPS

- Global availability
- High accuracy
- Continuous operation
- Free civilian access

VI. Limitations of GPS

- Signal blockage in tunnels and urban environments
- Susceptibility to interference and jamming
- Atmospheric effects on accuracy
- Dependence on satellite visibility

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VII. Future Developments

GPS is increasingly integrated into the broader Global Navigation Satellite System (GNSS), which includes systems such as GLONASS, Galileo, and BeiDou. This integration enhances positioning accuracy, availability, and reliability [4].

VIII. Conclusion

The Global Positioning System has revolutionized navigation and positioning technologies. Its ability to provide accurate and real-time data has made it indispensable across multiple sectors. Despite certain limitations, continuous advancements in GNSS technologies are improving its overall performance.

References

[1] E. D. Kaplan and C. J. Hegarty, *Understanding GPS: Principles and Applications*, 2nd ed. Norwood, MA, USA: Artech House, 2006.

[2] B. W. Parkinson and J. J. Spilker, *Global Positioning System: Theory and Applications*. Washington, DC, USA: AIAA, 1996.

[3] B. Hofmann-Wellenhof, H. Lichtenegger, and E. Wasle, *GNSS – Global Navigation Satellite Systems*. Vienna, Austria: Springer, 2008.

[4] P. Misra and P. Enge, *Global Positioning System: Signals, Measurements, and Performance*. Lincoln, MA, USA: Ganga-Jamuna Press, 2011.

[5] U.S. Government, "GPS.gov: Official GPS information," 2023.

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