SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A+'
Grade Approved by AICTE, New Delhi & Affiliated to Anna University,
Chennai

DEPARTMENT OF AEROSPACE ENGINEERING

19ASZ301– ROBOTICS & AUTOMATION IN SPACE

III YEAR VI SEM

UNIT 5 –ROBOTIC APPLICATIONS IN SPACE

TOPIC - AEROSPACE AUTOMATION

OVERVIEW OF AEROSPACE AUTOMATION

Definition:
- Aerospace automation involves using robotics, control systems, and intelligent software to execute tasks in space and aviation with minimal human intervention.

Automation Levels in Aerospace:
- Manual: Human-controlled systems
- Assisted: Pilot aids (e.g., autopilot)
- Semi-autonomous: Shared control between systems and humans
- Fully autonomous: Independent system decision-making

Key Domains:
- Satellite operations
- Spacecraft navigation and docking
- Automated launch systems
- On-orbit servicing robots
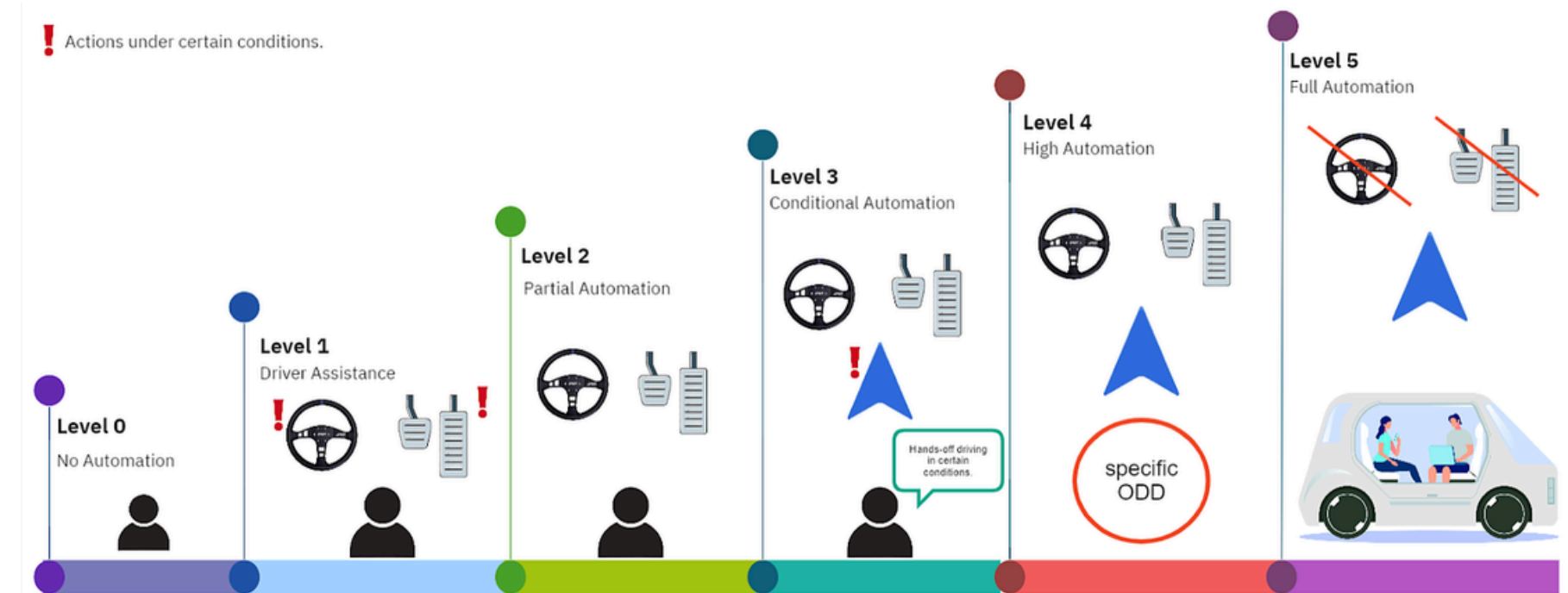
AUTOMATION IN AEROSPACE SYSTEMS – KEY AREAS

Automation Area	System Type	Function/Benefit
Launch Systems	Automated launch control	Precise timing and ignition control
Spacecraft Guidance	GN&C (Guidance, Nav, Control)	Auto course correction and orbit insertion
Satellite Operations	Autonomous attitude control	Target alignment and stability
On-Orbit Servicing	Robotic arms & drones	Refueling, repairing, repositioning
Reentry & Landing	AI-guided landing systems	Safer reentry with adaptive control

ADVANTAGES AND CHALLENGES OF AEROSPACE AUTOMATION

Emerging Trends:

- AI-based fault diagnosis
- Swarm satellite coordination
- Autonomous planetary exploration (e.g., rovers)

Advantages	Challenges
Reduces crew workload	High development and validation cost
Enables longer, unmanned missions	Complexity in system integration
Enhances safety and reliability	Cybersecurity vulnerabilities
Operates in hazardous or unreachable environments	Real-time decision-making limitations