

Motivation

In over four decades, ISRO has made stunning progress in the design, manufacturing, flights and operation of launch vehicles, and communication, remote sensing, navigation, and space sciences satellites. So far, ISRO has had 87 space missions since 1975, and has in its repertoire 14 geostationary communication satellites, 13 sun-synchronous and 4 geostationary earth observation satellites, a regional navigation system (NavIC) cradled in a constellation of 7 satellites at geostationary altitudes, and an operational GPS-aided geostationary augmented navigation system for civil aviation – all benefiting India and beyond. ISRO explores space frontiers via Astrosat, Chandrayan, and Mars Orbiter, and has launched 180 foreign satellites – a fait accompli that may startle some. Government of India has allocated Rs. 9100 crores to ISRO for the year 2017-18. Bold successes of ISRO have stimulated private enterprises to escalate their stakes in the governmental aerospace endeavors. In the context of this invigorating panorama, the present course is developed to fulfill the need of practicing engineers to learn the subject of space vehicles and their payloads attitude dynamics and control quickly so that they could contribute in their organizations without interrupting their job for years to earn an academic degree.

Course Contents

Spacecraft and Payload Pointing and Control

- Attitude kinematics and dynamics
- Spin stabilization for transfer orbit
- Spin stabilization in orbit
- Attitude control in space – basics
- Magnetic attitude control
- Momentum-biased attitude stabilization
- Momentum-biased satellites control with jets
- Time-energy optimal control for large-angle maneuvers: single-axis
- Reaction jet pulse-modulated attitude control: single-axis
- Structural dynamics and liquid sloshing
- Attitude control of flexible satellites
- Attitude control of flexible bias-momentum geosynchronous communication satellites
- Precise tracking of moving targets
- Scanning/spinning payload controllers and image motion compensator
- Attitude determination and Kalman filtering

Application of theory to the ISRO and NASA spacecraft and illustrations will be an integral part of the course.

References

1. Sidi, M., *Spacecraft Dynamics and Control*, Cambridge University Press 1997

2. Markley, F. L., and Crassidis, J. L., *Fundamentals of Spacecraft Attitude Determination and Control*, Springer 2014
3. Smit, G. N., *Spacecraft and Payload Pointing*, AIAA 2015
4. Franklin, G.F., et al, *Feedback Control of Dynamic Systems*, Prentice Hall, 2006
5. Lurie, B.J., and Enright, P.J., *Classical Feedback Control*, Marcel and Dekker, 2000
6. Hughes, P.C., *Spacecraft Attitude Dynamics*, John Wiley, 1986
7. Kaplan, M. H., *Modern Spacecraft Dynamics and Control*, John Wiley, 1976
8. Agrawal, B, *Design of Geosynchronous Spacecraft*, Prentice Hall, 1986
9. Chobotov, V. A., *Spacecraft Attitude Dynamics and Control*, Krieger Publishing Co., 1991
10. Bryson, A.E., *Control of Spacecraft and Aircraft*, Princeton University Press, 1994
11. De Ruiter, A. H. J., Damaren, C. J., and Forbes, J. R., *Spacecraft Dynamics and Control, -- An Introduction*. Wiley 2013

Lodging & Boarding

Accommodation in the campus may be available for participants on payment basis and with advance request.

WHO MAY BENEFIT?

Professionals dealing with satellite and payload motion control in aerospace organizations and companies; teachers who plan to teach this subject in their colleges.

VENUE, DATE & TIME OF REPORTING

Classes will be held during May 15-26, 2017 at IIT Indore, Indore, MP.

REGISTRATION

For CEP participants from ISRO, DRDO, CSIR or any Govt organization, and any academic institute, the registration fee is Rs. 40000, and for participants from industries, the fee is Rs. 50000. This includes the course notes on a CD, their stay and dining facility. There will be 10% reduction in fee for multiple participants from the same organization. No income tax is to be deducted at the source from the course fee payments as IIT Indore is exempted from the same.

The completed registration forms from the interested participant must be received by the Coordinator electronically at the e-mail address given below by May 1, 2017.

Course coordinator:

Prof. H. B. Hablani

Fellow INAE, AIAA Associate Fellow

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Indian Institute of Technology

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IMPORTANT DATES

Last date of registration : May 1, 2017

Course dates: May 15-26, 2017



Continuing Education & Quality Improvement Programs

CEP Ten-Day Course on

Spacecraft and Payload Pointing and Control

May 15-26, 2017

Coordinator / Educator

Prof. H.B. Hablani
Fellow INAE, AIAA Associate Fellow
Center of Astronomy

OFFICE OF
CONTINUING EDUCATION &
QUALITY IMPROVEMENT PROGRAMMES

Indian Institute of Technology - Indore
Indore, MP 453 552

REGISTRATION FORM

CEP Ten-Day Course on
Spacecraft and Payload Pointing and Control

May 15-26, 2017

Name(in block letters): _____

_____ Gender: _____

Designation: _____

Organization: _____

Mailing Address: _____

Telephone: _____

Email: _____

Mobile: _____

Educational Qualification: _____

Specialization: _____

Experience: _____

Accommodation in Campus: YES / NO

PAYMENT: D.D. No.:

Dt.

Rs.

[Demand draft should be drawn in favour of "The Registrar, IIT Indore (CEP A/c)"].

Date:

Signature of Applicant

Approval of the Organization: