INTRODUCTION TO LAUNCH VEHICLE
ANALYSIS AND DESIGN

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TYPE OF COURSE : New | Both | UG/PG
COURSE DURATION : 8 Weeks (15 Feb' 21 - 09 Apr' 21)
EXAM DATE : 24 Apr 2021

PRE-REQUISITES : No specific pre-requisites are necessary. However, basic understanding of rigid
body mechanics, fluid mechanics, and thermodynamics is desirable.

INTENDED AUDIENCE : Undergraduate / postgraduate students, participants from industries involved
with tasks related to space agencies, personnel from defence establishments
engaged with missile system configuration design, teachers of engineering
colleges having aerospace as the discipline

COURSE OUTLINE :
Space has always been of keen interest to mankind as it is believed to contain information relevant to
formation, existence and continued sustenance of our planet. Space mission is defined as an act of
transporting a space object to its designated spot and then carrying out the scientific / technological
activities. Transportation of these objects is done through launch vehicles which are important elements
of any space mission. Launch vehicles provide the space object with sufficient energy to enable it to set
us a desired space mission. The course aims to introduce fundamental principles governing ascent
mission trajectory design including the configuration design of launch vehicles. It also aims to present
various techniques that help in synthesizing the trajectory and the launch vehicle for specified
objectives.

ABOUT INSTRUCTOR :
Dr. Ashok Joshi is a professor of Aerospace Engineering at the Indian Institute Technology, Bombay in
the broad area of Dynamics and Control of Flexible Flight Vehicles. He has over thirty-five years of
Teaching and research experience in the broad areas of Modelling, Dynamics, Navigation, Control and
Guidance of Flexible Flight Vehicles. His research interests include; Flight Vehicle Navigation &
Guidance, Structure-Control Interaction, Unmanned Aerial Systems, Multi-agent swarming algorithms,
collaborative and cooperative missions. He has published 41 papers in journals and 74 in conference
proceedings. He has taught the spaceflight mechanics to both undergraduate and postgraduate
students for more than fifteen years.

COURSE PLAN :
Week 1: Introduction
Week 2: Space missions and role of launch vehicles
Week 3: Space missions and role of launch vehicles (Cont'd)
Week 4: Ascent Mission Analysis and Design
Week 5: Ascent Mission Analysis and Design (Cont'd)
Week 6: Multi-staging: Basic concept
Week 7: Multi-staging: Staging solution & its sensitivity
Week 8: Multi-staging: Series and parallel staging, optimal staging solutions