

Completed Registration form should be sent by regd. post to the following address:

QIP Office, CE & QIP,
Attn. QIP Course: "Aircraft Stealth Technology"
2nd Floor, Main Building
Indian Institute of Technology Bombay
Powai, Mumbai 400 076
Phone: (022) 25767048
Fax: (022) 25726199

IMPORTANT DATES

Deadline for submitting Application: Sept 1st, 2017

Notification of Acceptance: Sept 15th, 2017

Course Dates: November 10 – 14, 2017

- For additional copies of the registration form, use a photocopy of this brochure. For further details, ref. <http://www.qip.iitb.ac.in/qipcourse2017.php>

VENUE FOR COURSE

Lectures will be in the Seminar Hall, Jal Vihar Guest House, IIT Bombay.

DATE & TIME FOR REGISTRATION

Nov 10, 2017, 0900 h. at the venue.

ELIGIBILITY

Faculty members of degree level or above colleges / institutes recognized by AICTE.

COURSE EVALUATION

Successful participants will be awarded 'QIP Course Completion Certificate'.

REGISTRATION

There is no registration fee for the QIP course. All registered candidates are required to confirm their participation by sending a Demand Draft of ₹ 2000/- in the name of "Registrar IIT Bombay". This amount will be refunded to the participant if s/he attends the course. If a participant does not attend the course, this

amount will be forfeited. Shortlisting and confirmation of eligible candidates will be on a first come first serve basis, up to a maximum of 60 candidates.

TRANSPORT, BOARDING, & LODGING

Participants are entitled for II class (Sleeper Class) or III AC railway to and fro fare by the shortest route from their college / institute to IIT Bombay. All participants will be given auto rickshaw fare from Kanjurmarg / Andheri Rly. Station to IIT on the dates of arrival and departure. Local participants (from Mumbai, Navi Mumbai, or up to Karjat / Kasara / Khopoli) will be paid 2nd class railway fare or BEST Bus fare.

Boarding and lodging will also be provided free of cost. Accommodation will be provided in the students Hostel or Guest House on sharing basis. Since, on-campus accommodation is limited, family members of the participants cannot be given accommodation by QIP-office.

For information on other Quality Improvement Programmes at IITB, contact:

QIP Office, CE & QIP, IIT Bombay, Powai, Mumbai 400076. Tel. no. (022) 25767048.

Email: qip@iitb.ac.in

For further details: <http://www.qip.iitb.ac.in>

FACULTY

The faculty instructors in this course include Prof. Shripad P. Mahulikar (course coordinator), Prof. G.R. Shevare, Prof. N. Ananthkrishnan, Prof. Ramnath P.R.C. Aiyar, Prof. Avijit Chatterjee, Prof. P.J. Guruprasad.

COURSE MATERIAL

- All international Journal Papers of Prof. S.P. Mahulikar (course coordinator), in the field of Aircraft Stealth Technology / Infrared Signatures.
- The other instructors may provide non-classified academic material based on their lectures.

QIP Short Term Course On Aircraft Stealth Technology

November 10 – 14, 2017



Office of

Continuing Education & Quality

Improvement Programs



Prof. S.P. Mahulikar (Course coordinator)
Department of Aerospace Engineering
Indian Institute of Technology Bombay
Powai, Mumbai 400076

QIP Short Term Course on
Aircraft Stealth Technology
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Registration Form

INTRODUCTION

The number of countries possessing nuclear weapons is large, but the number of countries having the knowhow for making stealth aircraft is limited. Hence, *Stealth Technology*, provides a quantum leap in military power and will shape future warfare. Stealth technology is kept as a closely guarded secret by the countries possessing it. There is a dearth of information in the open literature, which has resulted in several schools of opinion and consequently misconceptions also. Therefore, there is a need for a consolidated and comprehensive course, aimed at demystifying this topic. Also, the proliferation of Infra-Red (IR) guided MAN Portable Air Defence Systems (MANPADS) including with terrorist groups, have emerged as a major cause of aircraft and helicopter loss in tactical warfare and skirmishes.

OBJECTIVE OF THE COURSE

This course will present the evolution of airpower and the ever-increasing component of stealth technology in dictating warfare, based on the current need to integrate and place them in the right perspective. Hence, the role of stealth aircraft and the dominance of all aspects of stealth technology, especially in tactical wars, conflicts, & skirmishes will be discussed. The integration of the fundamental aspects of stealth technology - through its classification, types of aircraft signatures: especially radar, IR, and visual signatures, their sources of origin, modelling techniques, and methods of signature reduction will be discussed. Due to the increasing importance of passive IR-signatures, their close examination and analysis will be presented. The IR-signatures from aircraft and helicopter are used to detect, track, lock-on, and destroy them unserviceably. The IR signature studies are now mandatory to counter this threat for survivability enhancement and are a vital aspect in Stealth Technology. The course will present the contemporary developments in this emerging field, with particular emphasis on IR signature prediction from aerospace vehicles. The role of the atmosphere in IR signature analysis, viz. transmission and background radiance will be illustrated. The relation between IR signature level, lock-on range, lethal range, and susceptibility (probability of hit), will be presented. Also, IR signature suppression systems and countermeasure techniques will also be presented, to highlight their effectiveness and implications in terms of performance penalties.

COURSE CONTENTS

- Principles of Stealth – camouflage, conceal, deceive;
- Active vs. Passive detection;
- Mission Attainment Measure, Aircraft Survival rate, Measure of Mission Success, & Mission Goal;
- Survivability, Susceptibility, Vulnerability of Aircraft & Helicopter in Human-made Hostile Environment;
- Precision Guided Weapons & Role of Stealth Aircraft;
- Introduction to Aircraft Signatures – radar (Radar Cross-Section & its reduction), IR, Visual, Aural;
- Introduction to Materials for Stealth;
- Stealth related to air-intakes;
- Stealth related to UCAV design;
- Basics of high frequency RCS of aerospace & naval targets;
- Extremely low frequency electric field modeling & reducing signatures;
- RCS computations for realistic geometries - issues & challenges;
- Design synthesis & modeling of Radar Absorbing Materials;
- Aero-acoustic field & its modeling;
- Simulation & mitigation of laser lethality;
- Principles of IR Radiation – basic laws (Planck's, Wien's Displacement, Kirchhoff's), Grey Body spectrum of Solid Surfaces vs. Line & Narrow Band Emission from Unsymmetrical Gases [e.g. CO₂, H₂O (vap.)];
- IR Signatures in 2–3 μm, 3-5 μm, 8-12 μm;
- IR Signatures from Internal Sources – engine heated casing, engine exhaust plume, aerodynamic heating of airframe in supersonic aircraft;
- Simulation of plume for IR signature;
- IR Signatures from External Sources – reflection of earthshine (in 8-12 μm), sunshine (in 2–3 μm followed by 3-5 μm), & sky-shine (in 8-12 μm);
- Role of Atmosphere – attenuation of IR-signature by intervening atmosphere & atmospheric background radiance;
- Relation between IR-Signature and Aircraft / Helicopter Susceptibility – lock-on envelope & lethal envelop for air-to-air combat in horizontal plane;
- IR-Signature Suppression (& its Penalties) – optical blocking, cooling, emissivity optimization;
- IR Countermeasures (IRCM) for point IR-detection – decoys / flares;
- IRC²M – imaging IR-detectors.

Name* (in block letters): (Mr/Mrs/Ms) _____

Designation*: _____

Organization*: _____

Mailing Address*: _____

Telephone: _____ Mobile*: _____

Fax: _____

Email*: _____

Educational Qualifications*: _____

Discipline/Specialization*: _____

Accommodation Required*: YES / NO

Exposure to 10+2 level Physics/Maths*: YES/NO

Whether teaching/taught any biology course*: YES/NO

Name of course (only if answer is YES)*: _____

Signature of Applicant*:

AICTE Permanent ID*:

Sponsorship & signature of Head of the College /
Institute (with date & seal)*.

(IMPORTANT:

BY SIGNING ABOVE HEAD OF THE
COLLEGE/INSTITUTE CERTIFIES THAT APPLICANT IS A
FACULTY MEMBER OF DEGREE LEVEL ENGINEERING
COLLEGE RECOGNIZED BY AICTE AND AICTE PERMANENT
ID WRITTEN ABOVE IS CURRENTLY VALID).

* Required fields otherwise application will be rejected.