

GUIDELINES FOR COMPETENCY BASED POSTGRADUATE TRAINING PROGRAMME FOR MD IN AEROSPACE MEDICINE

Preamble:

The purpose of PG education is to create specialists who would provide high quality health care and advance the cause of science through research & training.

The **goal** of the training programme for MD in Aerospace Medicine is to produce a post-graduate student who after undergoing the required training should be able to deal effectively with the needs of the community and should be competent to handle all problems related to his/her specialty including recent advances. The student should also acquire skill in teaching of medical/para-medical students in the subject that the student has received his/her training. The student should be aware of his/her limitations.

The purpose of this document is to provide teachers and learners illustrative guidelines to achieve defined outcomes through learning and assessment. This document was prepared by various subject-content specialists. The Reconciliation Board of the Academic Committee has attempted to render uniformity without compromise to purpose and content of the document. Compromise in purity of syntax has been made in order to preserve the purpose and content. This has necessitated retention of “domains of learning” under the heading “competencies”.

SUBJECT SPECIFIC LEARNING OBJECTIVES

The post graduate students are expected to attain high proficiency both in theoretical and practical aspects of Aerospace Medicine and other allied disciplines including operational aspects and recent advances. The objectives of post graduate training course would be to train a MBBS doctor who will:

- (a) Practice efficiently and effectively Aerospace Medicine backed by scientific knowledge and skill base.
- (b) Recognize the health needs of the subject and families and carries out professional obligations with empathy and a caring attitude and maintain high ethical standards.
- (c) Continue to evince keen interest in continuing education in the specialty irrespective of whether he/she is in a teaching institution or is a practicing specialist.
- (d) Be a motivated ‘teacher’ - defined as a specialist keen to share his knowledge and skills with colleagues, aircrew and students.
- (e) Have skills and knowledge to undertake independent research.
- (f) Effectively communicate with the person, family and the community.

SUBJECT SPECIFIC OBJECTIVES

The specific learning objectives of this training programme for MD in Aerospace Medicine are based on core competencies. The following objectives are laid out to achieve the goals of the course. These objectives are to be achieved by the time the post graduate student completes the course.

The objectives may be considered under the subheadings:

- (1) Cognitive domain (Knowledge)
- (2) Affective domain (Human values, ethical practice and communication abilities)
- (3) Psychomotor domain (skills)

SUBJECT SPECIFIC COMPETENCIES

Competence is the habitual and judicious use of communication, knowledge, technical skills, clinical reasoning, emotions, values, and reflection in daily practice for the benefit of the individuals and communities being served. Competence-based training focuses on learning by doing. Core competencies are the essential knowledge, values and skills vital to the successful performance of one's job function i.e. effective practice of medical care.

By the end of the course, the student should have acquired knowledge (cognitive domain), professionalism (affective domain) and skills (psychomotor domain) as given below:

A. Cognitive domain

This includes competencies with respect to *the core discipline* as well as *problem-solving* abilities.

The student should be able to:

- (a) Demonstrate understanding of basic sciences relevant to this specialty.
- (b) Identify social, economic, environmental and emotional determinants in a given case, and take them into account for planning therapeutic measures.
- (c) Possess knowledge and competence to write aero-medical opinions on a wide variety of clinical cases.
- (d) Be able to contribute meaningfully in all aspects of aircraft accident investigation especially aero-medical aspects and human factors.
- (e) Possess comprehensive knowledge of flying clothing and life support systems of aircraft on base and update the same with regular interaction with technicians and aircrew.

- (f) Identify aero-medical problems at a flying station/airline and offer appropriate solution.
- (g) Advise regarding the management of the case and to carry out this management effectively. Update oneself by self study and by attending courses, conferences and seminars relevant to the specialty.
- (h) Recognize conditions that may be outside the area of his specialty/competence and to refer them to the proper specialist.
- (j) Undertake audit, use information technology tools and carry out research, both basic and clinical, with the aim of publishing his work and presenting his work at various scientific forums.
- (k) To develop a comprehensive knowledge of challenges posed to normal physiology by the aerospace environment.
- (l) Describe aetiology, patho-physiology, principles of diagnosis and management of common problems including emergencies, in adults and children.
- (m) Describe indications and methods for fluid and electrolyte replacement therapy including blood transfusion.

B. Affective Domain (Human values, Ethical practice and Communication abilities)

- (a) Demonstrate professionalism and adopt good ethical principles in all aspects of his/her practice. Professional honesty and integrity are to be fostered. Care is to be delivered irrespective of the social status, caste, creed or religion of the patient.
- (b) Recognize personal beliefs, prejudices, and limitations.
- (c) Develop interpersonal and communication skills, in particular the skill required to explain preventive health aspects and increase awareness of aero-medical concerns for aircrew.
- (d) Provide leadership and get the best out of his team in a congenial working atmosphere.
- (e) Apply high moral and ethical standards while carrying out human or animal research.
- (f) Be humble and accept the limitations in his knowledge and skill to ask for help from colleagues when needed.
- (g) Respect patient's rights and privileges including patient's right to confidentiality, information and right to seek a second opinion.

C. Psychomotor domain

During the course, the student should develop the following skills:

- (a) Possess ability and competence to take a proper clinical history, examine the patient, perform essential diagnostic procedures and order relevant tests and interpret them to come to a reasonable diagnosis about the clinical condition.
- (b) Perform common procedures relevant to the specialty.
- (c) In the core competence domain of system-based practice,
 - (i) Demonstrate a practical, efficient and cost-effective approach to health care management,
 - (ii) Utilize knowledge in the field of health service delivery,
 - (iii) Demonstrate ability to follow the health care team approach to health care delivery.
- (d) Provide basic and advanced life saving support services (BLS and ALS) in emergency situations.
- (e) Demonstrate use of information management and procedural systems.
- (f) Demonstrate practice-based learning and improvement and be a physician scholar.
- (g) Possess academic skills and be able to teach and conduct clinical sessions, be familiar with research methodology and execute a thesis, write and present papers.
- (h) Undertake independent sizing and fitment and care of aircrew clothing.

Syllabus

During the training period, the student should undergo training in the following course contents:

Course contents

The course contents will be in four parts:

Part I: Basic Sciences

- (a) Aeronautics including Aerodynamics and principles of flight, Navigation, Navigational aids and Aeroengines.
- (b) Applied Physics including Atmospheric Physics, Cabin pressurization, Acceleration forces, Vibration stress, Impact and Crash forces, Ejection trajectory analysis, Thermal Stress, Refrigeration, Effects of Noise, illumination, Optics and Radiation Space Physics.
- (c) Bio-medical engineering including Basic of Electronics, Instrumentation systems, principles of physiological monitoring systems and their application, biochemistry, familiarization of electro-medical equipments in use in Aerospace Medicine, Electrical safety, element of biomechanics - solid and fluid mechanics.

- (d) Medical statistics related biomedical research-descriptive studies, relations and predictions of variables, parametric and non- parametric tests.
- (e) General physiology including cardiopulmonary physiology, mechanics of respiration, hemodynamics, regulatory mechanisms, functional assessment and ageing.
- (f) Metabolic and endocrine biochemistry including bioenergetics and metabolism of carbohydrates, lipids, proteins and amino acids, enzymes used in clinical diagnostics, free radicals and nutrition.
- (g) Neuro-physiology including mechanics of sensory perception integration, reticular activating system, limbic system and physiology of emotions.

Part II: Aerospace Physiology

- (a) High altitude physiology including respiratory physiology in flight, hypoxia and prevention, oxygen systems, decompression sickness. Rapid decompression, aero-medical problems in high altitude operations, hyperbaric oxygen medicine.
- (b) Environmental physiology including thermal stress, thermal regulation and prevention of thermal effects.
- (c) Acceleration physiology including G-LOC, SACM, Anti-G suit, PBG, cardiovascular and respiratory changes during acceleration, protection against +Gz, effects of -Gz, Transverse and lateral G.
- (d) Fundamentals of space physiology simulation of micro G, conditioning, training and evaluation, life support systems, escape and survival, weightlessness, space sickness, countering gravitational and thermal stresses, vector cardiology in space environment, animal based experiments, extra vehicular activity in space and rescue.
- (e) Physiology of women in aviation.

Part III: Applied Aerospace Medicine

- (a) History of Aerospace Medicine
- (b) Spatial Disorientation - static and dynamic, illusions, prevention, newer concepts.
- (c) Human engineering including ergonomics and anthropometry, spinal evaluation, cockpit design and instrument layout, cabin work station layout, work load studies, aids for vision enhancement, ejection and escape systems survival aids - PSP, snow, land and sea survival, air casualty evacuation and disaster management, crash investigation.
- (d) Human factors in civil and military aviation, CRM, human errors, hazards and flight safety.

- (e) Design and aero-medical evaluation of flying clothing and life support systems as applicable to civil and military aircraft and aero-medical equipment.
- (f) Civil aviation medicine including ICAO medical policies, DGCA India medical organization and policies, licensing medical examinations, flight duty time limitations, traffic and approach, air hygiene and sanitation, catering, epidemiological and immunological problems; IHO, air ambulance and air hospitals, long range and ultra long range airline operations.
- (g) Preventive and Social Medicine including environment and health, pollution - air and water, sanitation and purification, occupational health of air and ground crew, health education and communication, NBC warfare and protection, non-communicable diseases, family welfare and immunization.
- (h) Aero-medical problems in air-to-air refueling, long duration fighter flying, sustained operations and exercises, international exercises, UN Missions for peace keeping.

Part IV: Clinical Aerospace Medicine

- (a) Internal Medicine including cardiovascular, respiratory, nervous and renal systems, gastroenterology, hepatology and metabolic disorders, rheumatological disorders, common medical disorders in aircrew, drugs and the flier.
- (b) Aviation ophthalmology including physiology of vision and colour vision, optics, refraction and optometry, common eye disease, visual problems in aero-medical evaluation of ophthalmic disorders.
- (c) Aviation otolaryngology including noise stress and conservation of hearing, vestibular functions, disorientation and their assessment, vestibular habituation, otitic and sinus barotraumas, deafness and sensory neural hearing loss, speech intelligibility, air sickness and its desensitization.
- (d) Aviation neuro-physiology including psychosis and neurosis, personality disorders, alcohol and drug dependence, psychosexual disorders, suicidal behavior, psychiatric emergencies, behavior therapy, biofeedback, sleep disorders, aviation related topics - head injury, fear of flying and aircrew selection.
- (e) Aviation psychology including personality traits and assessment, aircrew selection, cognitive processes and abilities, principles of learning, stress management, motivation, low motivation for flying and its evaluations and applied aspects of behavioral sciences.
- (f) Aviation pathology and toxicology, including collection, preservation and dispatch of specimens, histological findings, accident reconstruction and

investigation, identification of avian blood in aircraft accidents, chemical pathology, hematology, clinical pathology.

- (g) Radiology including Radiodiagnosis and assessment of head, neck, spinal and other skeletal injuries following accident, abnormalities of skeletal system, radiodiagnostic methods in cardiopulmonary, gastro-intestinal disorders, radiation hazards in Aviation, medical evaluation including investigations, diagnosis and disposal of medical, surgical and other disabilities in aircrew. Importance of postmortem radiological investigations in aircraft accident investigations.

TEACHING AND LEARNING METHODS

The detailed break-up of teaching hours (Theory and Practical) for the three-year MD course is given as Appendix B.

(a) 1st year

- (i) Number of hours for teaching: 714 hours
- (ii) Number of hours of practicals /Demonstrations: 542 hours
- (iii) Common Training Programme (as listed below)

(b) 2nd Year

- (i) Clinical attachment to Teaching Hospital (Dept of Medicine): 24 weeks
- (ii) Local /Outstation visits: (7 weeks) as below (Illustrative):

Sl No	Location	Duration
1.	Naval Base (Indian Naval Ship Hansa), Goa	3 days
2.	Indian Naval Ship Virat/ Indian Naval Ship Mumbai/Air India, Mumbai	3 days
3.	No. 2 Wing Air Force, Pune	3 days
4.	Air Force Academy/ No. 2 Aeromedical Training Centre (AMTC) /Indian Airlines, Hyderabad	4 days
5.	Air Force Station, Bidar	2 days
6.	Leh/Thoise	4 days
7.	Defence Institute of Physiology & Allied Sciences (DIPAS)/ Institute of Nuclear Medicine & Allied Sciences (INMAS)/ Defence Institute of Psychological Research (DIPR) /Air Force Central Medical Establishment (AFCME)/Parachute Repair Depot/ Air Combat Simulator, Hindon	3 days
8.	AF Station Ambala/Air Force Station Gorakhpur	2 days
9.	No. 3 Base Repair Depot (BRD), Chandigarh	2 days
10.	Defence Bioengineering and Electromedical laboratory (DEBEL), Bengaluru	1 day
11.	Aircraft System Training Establishment (ASTE), Bengaluru	1 day
12.	Hindustan Aeronautics Limited (HAL), Bengaluru	1 day
13.	Air Force Selection Board (AFSB)/ All India Institute of Speech and Hearing (AIISH) / Defence Food Research laboratory (DFRL)/ Central Food Technological Research	2 days

	Institute (CFTRI), Mysore	
14.	Air Force Station, Yelahanka	1 day
15.	National Aerospace Laboratories (NAL), Bengaluru	1 day
16.	Aeronautical Development Agency (ADA), Bengaluru	1 day
17.	Indian Space Research Organisation (ISRO), Thiruvananthapuram	3 days
18.	Air Force Technical College (AFTC), Bengaluru	1 day
19.	Vikram Sarabhai Space Centre (VSSC), Thiruvananthapuram	4 days

Each visit has an objective and the same is spelt out during the pre-visit briefing to the post graduate students and also to the units they are visiting. One instructor from this Institute accompanies the post graduate students during the tour. The post-visit debrief covers aspects learnt and whether terminal learning objectives achieved. The post graduate students fill out 'end of visit' proforma towards this assessment.

(iii) Rotation:

Postings- Department Activity: Students are attached to all the departments on rotation. During this period, they take part in all the routine activities of the department, including training of aircrew, testing of aero-medical equipment, procedures and research. Clinical specialists at IAM conduct clinics in the afternoon.

Rotations suggested

Educational visit	-	7 weeks
Attachment to Teaching Hospital	-	24 weeks
Departmental Attachments	-	13 weeks
MEC	-	3 weeks
Acceleration	-	2 weeks
HAP	-	2 weeks
Environment and Space Physiology	-	2 weeks
Human Engineering	-	2 weeks
Biophysics / Biomedical engineering	-	2 weeks
Clinical Attachments	-	4 weeks
Aviation Psychiatry	-	1 week
Aviation Ophthalmology	-	1 week
Aviation Otorhinolaryngology	-	1 week
Aviation Psychology	-	1 week

(iv) **Assigned duties:** The post graduate students perform assigned duties in the form of referrals in MEC, preflight and sick report at ASTE, preflight at NFTC and sick report at IAM SMC.

(v) Common Training Programme (as listed below)

(vi) MD Thesis: Collection and collation of data.

(c) 3rd Year

- (i) MD Thesis: Collection and collation of data, submitting of MD Dissertation.
- (ii) Preparation for Examination.
- (iii) Common Training Programme (as listed below)
- (iv) Clinical attachment to various departments as per Appendix 'A' given below:
For clinical attachments, clinical specialists at teaching hospital / IAM will conduct clinics.
- (v) Departmental attachments (including Medical Evaluation Centre) as per **Appendix A.**

Rotations suggested

Departmental Attachments	-	34 weeks
MEC	-	5 weeks
Acceleration + Spatial Disorientation	-	4 + 3 weeks
HAP + Hyperbaric Medicine	-	4 + 3 weeks
Environmental + Space Physiology	-	4 + 3 weeks
Human Engineering + NVG	-	4 + 3 weeks
Biophysics/Biomedical engineering	-	1 week
Clinical Attachments	-	10 weeks
Aviation Psychiatry	-	2 weeks
Aviation Ophthalmology	-	2 weeks
Aviation Otorhinolaryngology	-	2 weeks
Aviation Psychology	-	2 weeks
Clinical Aviation Medicine	-	1 week
Aviation Pathology	-	1 week

Appendix 'A'

SL No	Subject	Theory	Practical	Clinics	Demonstration	Others
1	Aeronautics	22	-	-	3	4
2	Applied Physics, NVG Training and Biodynamics	26	22	-	-	-
3	Medical electronics, Biomedical Engineering and Instrumentation	38	-	-	-	-
4	Biostatistics and Research Methodology	30	-	-	-	-
5	General Physiology including Biochemistry	90	22	-	-	-
6	High Altitude Physiology and Hyperbaric Medicine	82	57	-	-	18 (S)
7	Acceleration and Vestibular Physiology	54	108	-	-	24 (S)
8	Human Engineering	85	40	-	51	-
9	Practice of Aviation Medicine in the Field	15	-	-	21	-

10	Civil Aviation Medicine	19	-	-	-	-
11	Preventive and Social Medicine	26	-	-	-	-
12	Medicine	82	-	52	-	-
13	Aviation Ophthalmology	15	-	15	-	-
14	Aviation Otorhinolaryngology	19	-	15	-	-
15	Neuropsychiatry	36	-	10	-	-
16	Aviation Psychology	32	10	-	-	-
17	Aviation Pathology	23	30	-	-	-
18	Radiology	20	-	-	40	-
19	Seminars, Symposia, Reviews, Case Presentations	250 hours				
20	Open /Guest Lectures	69 hours				
	TOTAL	714	289	92	115	46
	Theory and Practicals	714	542			
	GRAND TOTAL	1575 hours				

S.No.	SUBJECT	HOURS
	Introductory Lectures (5)	
1	<u>Operational aspects of Military Aviation:</u> Role of Indian Armed forces in national security, India as a prominent player on the world stage in the changing world order, concept of war if nation's legitimate interests are challenged, diverse role of Armed Forces in matters of internal security, Role of Air Power in projecting military might to serve national goal, MOs to understand their role with above perspective.	1
2	<u>Operational aspects of Civil Aviation:</u> Civil Aviation growth in the world, operational activities in civil aviation industry, components of medical services set up in civil aviation, scope of civil aviation medicine practice.	1
3	<u>Operational role of Air Force and its medical components :</u> Introductions to concepts of air defense, ground attacks, close air support, reconnaissance, missile platforms, etc., impact of technology and force multipliers like UAVs, mid-air refueling, long range weapon system and related medical aspects to be introduced.	1
4	<u>Operational elements of Military Air field and civil aerodrome :</u> Introduction to typical AF combat squadron and station, differences in flying unit, ground unit and mobile units, operational structure of AF at Air HQs and command HQs, flight safety in activities in a typical large AF airfield and civil international aerodrome.	1
5	<u>Operational aspects of Medical Services in IAF :</u> Introduction to medical organization and its operational role at Air HQs and command HQs, importance of medical elements from Med-1 to Med-8, AF station medical setup, independent MI rooms and SMCs.	1
	AERONAUTICS (3)	
1	<u>Aeronautics of H/C flying, formation flying aerobatics</u>	1
2	<u>Case studies of a/c accidents due to aeronautical reasons</u> on ground, take off, level flights and landings.	1
3	<u>AF fleet inductions / improvements :</u> AJT, Kiran MK-I and II, MuLi role a/c, Hawk trainers, Su-30, Jaguar, Mirage, UAVs, ALH, LCH, Pechoras, Prithvi missiles, AWACS, Space applications, future ac inn HAL pipeline	1
	APPLIED PHYSICS, NVG TRAINING and BIO-DYNAMICS (2)	
1	Physics of missile launch, satellite, high altitude balloon missions, advances in space travel technologies, introduction to nuclear energy	1

2	Physics of UAV operations, laser in military use, advances in metallurgy and fuels	1
	MEDICAL ELECTRONICS, BIO-MEDICAL ENGINEERING AND INSTRUMENTATION (1)	
1	Instrumentation and protocol of recent advances in Bio-medical investigation techniques like stress thallium, nuclear bone scans, angiographies, CAT and MRI investigation and telemonitoring systems.	1
	Practicals (10)	
1	Department of Physics in consultation with other departments to add practicals on instrumentation and visits to investigation centers at CHAF and civil facilities	10
	CIVIL AVIATION MEDICINE (10)	
1	ICAO and DGCA medical standards for civil aircrew	1
2	Medical examination and filling up of CR-35 at specified AF stations	1
3	Preflight Medical examination in civil flying: Alcohol policy, breathalyzer tests, instruments and calibration procedures for domestic and international aircrew.	2
4	In flight medical emergencies and management: Airline policies, international regulations and airport facilities.	2
5	Methods and management of VVIP flights: food, water, security management	1
6	Clearance of invalid passengers: Domestic and international procedures, planning and facilitation for passengers and relatives. Lifer support systems on board and engineering requirements	1
7	Aircraft First aid and Physician kits: Guidelines of DGCA and airline management of kits	1
8	Training: In aviation medicine and medical aspects for aircrew, cabin crew, technical and support staff	1
	Practicals/Visits (6)	
9	Breathalyzer instrument calibration and visit to a civil airline medical facility	6
	PREVENTIVE AND SOCIAL MEDICINE (6)	
1	Medical plans based on security challenges: Concepts in medical management on terrorism, low intensity conflict, conventional war, possible use of nuclear weapons and missiles	2
2	Medical aspects of UN missions: Planning and IAF experiences on medical aspects of UN missions	2
3	Disaster Management: Policies, planning and AF assets. Revisit AF experiences during tsunamis, earthquakes. Concepts and past experiences in the world, of nuclear accidents	2
	MISCELLANEOUS LECTURES and RECENT ADVANCES	
1	Open lecture time/guest lecture/visits, on recent advances in any field related to aviation to keep the syllabus dynamic. Open time also for public speaking, writing medical papers, organizing seminars and conferences	10

Teaching - Learning Programme

During the training programme, patient safety is of paramount importance; therefore, skills are to be learnt initially on the models, later to be performed under supervision followed by performing independently; for this purpose, provision of skills laboratories in medical colleges is mandatory.

- (a) **Class Room Teaching:** As mentioned above during the first year.

- (b) The following **teaching and learning methods** to be used:
- (i) Lectures
 - (ii) Discussions
 - (iii) Student Directed Learning
 - (iv) Case Based Learning
 - (v) Role Playing
 - (vi) Simulated Patient Lab
 - (vii) Electronic and Computer Simulators
 - (viii) Web Based
- (c) **Training in teaching skills:** The students take classes for various courses in Aviation Medicine including the Primary course in Aerospace Medicine, Operational Training in Aerospace Medicine (OPTRAM) courses for Aircrew and courses for Medical Assistants.

Common Training Programme

- (a) **Clinical Training:** The clinical training for post graduate students is arranged at the institute, Command Hospital (AF) Bangalore. The thrust on clinical skills is to equip the post graduate students the wherewithal to apply the practical aspects of medicine to their beneficiaries. They will perform DMO duties in the hospitals during the entire course period.
- (b) **Participation in departmental activities:** Students are attached to the departments on rotation. During this period, they take part in all the routine activities of the department, including training of aircrew, testing of aero-medical equipment and procedures and research.
- (c) **Journal Clubs:** A journal club is arranged every fortnight. The students cover recent journal articles by rotation.
- (d) **Clinico-Pathological Meetings and Conferences:** Students attend clinical presentations and meetings every week and the routine clinico-pathological meeting at the Command Hospital, Air Force every month. They attend the yearly conference of the Indian Society of Aerospace Medicine. In addition, they are encouraged to attend other symposia/seminars on aviation medicine.
- (e) **Inter-departmental Meetings:** These are arranged fortnightly.
- (f) **Thesis:** The student must complete one thesis project as a part of training under a university recognized guide.
- (g) **Log Book:** Log books will be maintained and shall be checked and assessed periodically by the faculty members imparting the training.
- (h) A postgraduate student of a postgraduate degree course in broad specialities/super specialities would be required to present one poster presentation, to read one paper at a national/state conference and to present

one research paper which should be published/accepted for publication/sent for publication during the period of his postgraduate studies so as to make him eligible to appear at the postgraduate degree examination.

- (i) Department should encourage e-learning activities.
- (j) **MEC Attachments:** Attachments to MEC is a part of the training schedule to enable the student's ability to understand the medical evaluation process. This helps the post graduate students in applying the principles of Clinical Aerospace Medicine to individual cases and appreciate the aero-medical dispositions of ab-initio and trained aircrew. The post graduate students give opinions for medical board on variety of clinical cases under the supervision of the specialist concerned. Also, the post graduate students meet the President, MEC every morning for brief plan for the day and for the discussions on the previous day's cases and the rationale for their disposal.
- (k) **Practicals**
As per details given in Appendix 'A'.

ASSESSMENT

Assessment and Monitoring

The various domains of competence are assessed in an integrated, coherent, and longitudinal fashion with the use of multiple methods and provision of frequent and constructive feedback. Habit of mind and behavior, acquisition and application of knowledge and skills, communication, professionalism, clinical reasoning and judgment in uncertain situations, teamwork, practice-based learning and improvement and systems-based practice are assessed.

FORMATIVE ASSESSMENT, during the training programme

Formative assessment should be continual and should assess medical knowledge, patient care, procedural & academic skills, interpersonal skills, professionalism, self directed learning and ability to practice in the system.

General Principles

Internal Assessment should be frequent, cover all domains of learning and used to provide feedback to improve learning; it should also cover professionalism and communication skills. The Internal Assessment should be conducted in theory and clinical examination.

Quarterly assessment during the MD training should be based on:

1. Journal based / recent advances learning

2. **Patient based /Laboratory or Skill based learning**
3. **Self directed learning and teaching**
4. **Departmental and interdepartmental learning activity**
5. **External and Outreach Activities / CMEs**

The student to be assessed periodically as per categories listed in postgraduate student appraisal form (Annexure I).

SUMMATIVE ASSESSMENT, at the end of the course,

The summative examination would be carried out as per the Rules given in **POSTGRADUATE MEDICAL EDUCATION REGULATIONS, 2000.**

The post-graduate examination should be in 3 parts:

1. **Thesis**

Every post graduate student shall carry out work on an assigned research project under the guidance of a recognised Post Graduate Teacher, the result of which shall be written up and submitted in the form of a Thesis. Work for writing the Thesis is aimed at contributing to the development of a spirit of enquiry, besides exposing the post graduate student to the techniques of research, critical analysis, acquaintance with the latest advances in medical science and the manner of identifying and consulting available literature.

Thesis shall be submitted at least six months before the Theory and Clinical / Practical examination. The thesis shall be examined by a minimum of three examiners; one internal and two external examiners, who shall not be the examiners for Theory and Clinical examination. A post graduate student shall be allowed to appear for the Theory and Practical/Clinical examination only after the acceptance of the Thesis by the examiners.

2. **Theory Examination**

The examinations shall be organised on the basis of 'Grading' or 'Marking system' to evaluate and to certify post graduate student 's level of knowledge, skill and competence at the end of the training. Obtaining a minimum of 50% marks in 'Theory' as well as 'Practical' separately shall be mandatory for passing examination as a whole. The examination for M.D./ MS shall be held at the end of 3rd academic year. An academic term shall mean six month's training period.

There shall be four theory papers:

Paper 1: Basic Medical Sciences

Paper 2: Aerospace Physiology

Paper 3: Applied Aerospace Medicine

Paper 4: Clinical Aerospace Medicine & Advances in Aerospace Medicine

3. Practical/Clinical and Oral/viva voce Examination consists of:

(a) Long Case:

One long case from any of the following departments: Medicine, Psychiatry, ENT, Eye and Orthopedics

(b) Short Case:

Two short cases from any of the following departments: Medicine, Psychiatry, ENT, Eye and Orthopedics (2x25 marks)

(c) Aviation Practical

Oral/viva voce examination shall be comprehensive enough to test the post graduate student's overall knowledge of the subject.

Viva Voce Examination shall aim at assessing depth of knowledge, logical reasoning, confidence and oral communication skills as under:

- (a) Examination of all components of syllabus
- (b) Pedagogy

A topic is given to each student in the beginning of clinical examination. The student is asked to give a presentation on the topic for 8-10 minutes.

Recommended Reading:

Books (latest edition)

1. JA Gillies. Textbook of Aviation, Physiology, Pergamon Press, Oxford
2. Stanely Roscoe. Aviation Psychology, Iowa State Uty Press, Ames IA
3. Wesley E Woodson. Human Factors Design Hand Book, McGraw-Hill, New York
4. Albert L Wehninger. Principles of Bio Chemistry, CBS, arrangement with Worth Publisher New York, Delhi
5. Smith EL, Hiee RL. Principles of BioChemistry Mammalian Bio-n Chemistry, Inter-national Edition, McGraw-Hill Book, Singapore

6. Michel Loeb. Noise and Human Efficiency, John Wiley and Sons.
7. Earl W Weiner David C Nagal. Human Factors in Aviation, Academic Press INC, New York.
8. Wiener EL, Nagel Dc. Human Factors In Aviation, Academic Press Inc, New York
9. Best and Taylor. Physiological Basis of Medical Practice, Williams and Wilkins, Baltimore, USA.
10. Barrett. Text Book of Immunology, F A Davis Co, Philedelphia.
11. Ballantyon Groovg. Synopsis of Scott Brown Otorhinolaryngology, Butterworth and Co, UK.
12. Mark S, Sanders Ernest J McCornik. Human Factors in Engineering and Design, 7th Edition, McGraw Hills, New York.
13. Morgan CT, King Ra, Robinsons NM. Introduction to Psychology, TMH, New Delhi.
14. Alan Stokes, Kristen Kite. Flight Stress: Stress Fatigue and Performance in Aviation, Avebury, Cambridge.
15. Aitkenetal. Behaviour Science for Health Professionals, W B Saunders, New York.
16. Antia and Abraham. Clinical Dietetics and Nutrition, Oxford Uty Press, New Delhi.
17. Alan G Keir. Scott Brown Otorhinolaryngology, Butterworth and Co, UK .
18. Lislle Cormwell, Fredj Weibell, Erich A Pfeiffer. Bio-Medical Instrumentation and Measurement, PHI, New Delhi.
19. Abramsky. Multiple Sclerosis, Dunitz Martin limited, New York.
20. YC Fung. Fundamental of Bio Mechanics Springer, New York.
21. Anirban Biswas. Audio Vestibulometry, India.
22. Frank H Hawkins. Human Factors in Flight, Ashgate, Oxford UK.
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Appendix B: Detailed break-up of teaching hours (Theory and Practical) for the 3-year MD course

SI No	SUBJECT	Hrs
	AERONAUTICS (22)	
1	Principles of Flight. Streamline Air Flow, Bernoulli's Theorem, IAS and Ground speed.	2
2	Aircraft Manoeuvres and Controls	
	Aircraft axes and controls. Control surfaces. Forces acting on an aeroplane in level flight, climb and dive	2
	Stability and control - High wing and low wing configuration, Sweep back lateral stability, Manoeuvres - Pitching, Yawing, Rolling, Aerobatics, Spin, Roll, Loop, Inverted Flight, Phenomenon of side slip – diving	3
	High Speed flight - Aerofoil and body shapes, shock, stall, introduction to power controls	3
3	Aero Engines	
	Reciprocating engine. Familiarisation with parts of engines and their functioning	1
	Introduction to gas turbines. Centrifugal flow. Axial flow turbines Pulsejets, Ram jets.	1
4	Navigation	
	Principles of navigation. Flight plan - Ground speed and drift computation, correction of ETAS map reading and map marking.	2
	Navigational and landing aids. Flight instrument for the navigators. Flight display information.	2
	Map and tools used by navigators. Aids to provide ground fixes. Landing system for bad weather.	2
	Demonstration of navigational aids.	3
5	Meteorology	
	Visit to Meteorology section.	4
6	Airworthiness of an aircraft	1
7	Understanding of basic maneuvers	1
8	Understanding of basic combat	1
9	Understanding of weapon systems	1
	APPLIED PHYSICS, NVG TRAINING and BIODYNAMICS (26)	
1	Atmospheric physics: Physical characteristics and its variation with altitude, Structure of atmosphere, Standard atmosphere, Gas laws and their application in relation to flying, Measurement of pressure and volume.	2
2	Cabin pressurisation: Requirement of pressurised cabin, Pressurisation system, Types of pressurisation schedules, Decompression of pressurised cabin, Calculation of time of decompression; Explosive decompression.	2
3	Acceleration: Types of acceleration in aerospace operations – linear, radial and angular, Transient and sustained acceleration, Acceleration during free fall, Terminal velocity, Indicated air speed and true air speed.	3
4	Impact and impact protection: Deceleration during impact and its calculation, Factors affecting transmission of crash force, Factors affecting human tolerance, Mechanism of crash injuries.	2
5	Escape from Aircraft: Assisted escape system and acceleration encountered during assisted escape, Ejection forces, Ejection trajectory, Biodynamics of ejection, Acceleration overshoot, wind blast, drag, Parachute opening shock, Dynamic response index, Testing of personal survival pack.	4
6	Thermal Stress: Factors affecting heat stress in aircraft, Modes of heat exchange, Heat stress indices, Aircraft cooling system, Protective measures.	1
7	Vibration: Vibration in aviation and space, Single degree of freedom system, Vibration transmissibility, Mechanical impedance, Biodynamics and effects of vibration, Measurement and analysis of vibration, Standards Vibration exposure, Whole body vibration.	2
8	Noise: Noise in aviation and aerospace operations, Measurement and analysis of sound/noise, dB scale, Sound power, intensity and sound pressure level,	3

	Loudness level, Weighting scales, Speech intelligibility and speech interference levels, Signal to noise ratio, Permissible noise exposure limits and damage risk criteria, Hearing conservation and protective devices.	
9	Illumination: Electromagnetic spectrum, Photometric parameters, Problems of illumination in flying, Measurement of light, Testing of visors, Goggles.	2
10	Radiation: Radiation in aviation and space, Units, Types of radiation – Ionising and non-ionising, Microwave radiation, Lasers and laser safety.	2
11	Space physics: Space environment, gravity and its effects, Micro-gravity, Weightlessness, Acceleration in aerospace operations, Orbital velocity, Escape velocity, radiation, Van Allen belts, Space cabin.	3
	Practicals (22)	
1	Determination of vibration transmissibility of seated human subjects under low frequency vertical vibration.	6
2	Assessment of vibration stress tolerance of aircrew with history of spinal injury/ backache.	6
3	Assessment of light transmission characteristics of visor.	4
4	Measurement and frequency analysis of sound and noise.	6
	MEDICAL ELECTRONICS, BIOMEDICAL ENGINEERING AND INSTRUMENTATION (38)	
1	Introduction and Scope	2
2	Basics of Medical Electronics: (a) Basics of electrical and electronic engineering: Definitions and units of charge, voltage, current, conductors and insulators, Ohms law, Kirchoffs laws, Resistance, Capacitance and Inductance, Transformers, Active components - Diodes, Transistors and ICs. (b) Types of electronic circuits: Performance characteristics, Impedance matching, Amplifiers, Filters, Comparators, Convertors and Invertors, Power supplies, Clippers and Clampers, Multiplexers and demultiplexers, Modulation – AM, FM, PM, etc. Digital circuits, Basics of Boolean algebra, Logic gates, Sampling theorem and Analog to Digital conversion. (c) Aviation tolerant ckt. design: Circuit design for withstanding high-G, Vibration, Low pressure and Thermal environments. Power, volume and weight considerations	4 6 1
3	Medical Instrumentation: (a) General Instrument System: Characteristics - linearity, frequency response, range, accuracy, precision etc., Block diagram approach, Matching blocks and impedance's. Classification of medical instruments. (b) Transducers: Primary and secondary transducers, Characteristics. Transducers, R, L, C based transducers for flow, displacement, temperature, level, pressure, acceleration and rotation. Strain gage, LVDT, O ₂ and CO ₂ transducers, Ultrasound transducers, optical, auditory and radiation transducers, radiation detectors and counters. (c) Display devices and recorders: MC and MI instruments, CRT, video terminal, LED and LCD displays. Memories, tape storage, printers, chart recorders, x-y plotters, thermal, ink and laser printers, photographic and optical recorders.	2 2 1
4	Cardio-vascular Instrumentation: (a) ECG, Lead systems, Electrical system of the heart, HR and ECG recorder, digital ECG and auto interpretation, stress test systems, cardiac assist devices, pacemakers, defibrillators, IABP, H/L machine and cath lab. (b) Blood measurements: Blood pressure - invasive and noninvasive, flow, volume and velocity, viscosity, cell counters and biochemical analysis and blood gas analysis.	3 2
5	Respiratory Instrumentation: Measurement of RR, flow, pressures, volumes etc. Spirometry, Ventilators - time, volume cycled and programmable, Oxygenators, Artificial lung, Gas and vapour analysis.	2
6	Neurological instrumentation: EEG and EMG characteristics and recording, EEG machine, Digital EEG, Amplitude and frequency mapping, NCV - SNCV and MNCV, Repetitive stimulation, F wave and H reflexes. Evoked potentials - BAER, AEP, VEP, SEP and CERA. CSF monitoring.	4

7	Instruments for behavior: Instruments for cognition tests, GSR, BSR, Biofeedback - EMG, BP, Temp, EEG rhythm.	1
8	Instruments for long term monitoring: Multi-parameter monitoring, ICU, Central station, Ambulatory monitoring of ECG, BP and EEG, Apnea and respiratory monitoring, CNS, Sleep studies and Pulse-oxymetry.	1
9	Radiological Instrumentation: Principles of X-Rays, CT, PET, Ultrasound Imaging, MRI, fMRI, Angiography and DSA, etc.	2
10	Therapeutic Instruments: Electro-cautery and electro-surgery, Short wave diathermy, Ultrasound therapy, Phototherapy, Radio therapy, Lasers and their medical applications, etc.	2
11	Laboratory Instrumentation: Automatic Blood analysers, Ph meter, NMR and ESR spectroscopy, Gas chromatography, Fluorimeter, Glucometer, Spectrophotometer, HPLC etc.	2
12	Electrical Safety: Safety limits in electrical and medical equipment, Isolation and grounding, IEC and BIS standards.	1
BIostatistics and RESEARCH METHODOLOGY (30)		
1	Research methodology: Introduction, Types of studies - Experimental, observational, methods of Data collection, Data processing and analysis, Presentation of data, Role of statistics in medical research.	3
2	Descriptive Statistics: Types of data, Frequency distribution, Graphical Representation of data.	2
3	Dispersion, Measures of Central tendency and location: Percentiles, Measures of Variance, Deviation and standard deviation. Problems.	2
4	Probability and Distribution: Measures, conditional probability and Applications. Normal, Binomial, Poisson's, 't' and other distributions.	2
5	Relations and predictions of Variables: Scatter Diagram, Correlation, Karl Pearson's Correlation Coefficient, Rank Correlation Coefficient, Tests of Significance of Correlation. Regression, Fitting of Linear Regression, Test for Linearity of Regression. Extensions of Regression, Problems.	4
6	Sampling and Sample size: Types of population, Sample Size.	1
7	Statistical Inference: Null Hypothesis, Level of significance, One tail and two tail tests, Degrees of Freedom, Standard Error, Type 1 and Type 2 Errors.	2
8	Parametric Tests: Distribution of 'Z' Ratios, Testing of difference between the means of two large Samples, Student 't' Test- Paired and unpaired 't' test. Analysis of Variance-one-way classification, two-way classification, problems.	4
9	Non-Parametric tests: Chi-square test - Testing of Independence of attributes and Homogeneity of samples. Sign test, Wilcoxon Rank Sum test, Kruskal-Wallis test, Problems.	4
10	Problems and solutions, Data analysis.	6
GENERAL PHYSIOLOGY INCLUDING BIOCHEMISTRY (90)		
1	General Physiology	
	Homeostatic Mechanism	1
	The control systems of the body	1
2	Cardiovascular Physiology	
	Physiological anatomy of the heart and the blood vessels, neural control of cardiovascular system.	
	The heart as a pump, Cardiac muscle electromechanical properties, Electrical activation of the heart, Basis of EKG.	
	Cardiodynamics- Cardiac cycle, heart sounds, cardiac contractile force, pressure volume loops.	
	Cardiac output- measurement, control.	
	Regulation of blood pressure. Hydrostatic indifferent point.	
	CVS responses to orthostatic stress, vasovagal Syncope- pathophysiology, assessment and its aeromedical significance.	

	Physiology of various Circulatory shock	
3	Respiratory Physiology	
	Importance of Respiratory physiology in aviation, Physiologic anatomy of respiratory system with mention of Weibel Lung model.	1
	Gas laws. Respiratory Mechanics.	2
	Pulmonary Ventilation, pulmonary circulation, VP ratio, Alveolar oxygen tension	1
	Diffusion of Respiratory gases and their transport in the blood including Oxygen cascade, Oxy-Hb Dissociation Curve	2
	Respiratory control- Neural and chemical control.	2
	Pulmonary function test – static and dynamic	1
	Respiratory responses to stress including hypoxia, exercise	1
4	Exercise and Muscle Physiology	
	Cardiovascular, respiratory, neurological, humoral changes during exercise	2
	Energy systems of our body and its utilization in different sport activities	1
	Aerobic and anaerobic fitness	2
	Calculation of energy expenditure of different activities	1
	Aerobic Fitness Testing - Maximal vs Submaximal	1
	Anaerobic fitness testing	1
	Anaerobic threshold its importance in endurance sports	1
	Bicycle and treadmill protocol	1
	Principles of training and Effect of training to maintain physical fitness Aircrew	1
	Types of skeletal muscle and their role in different sport activities, Basic skeletal muscle physiology	1 ½
	Physiology of muscle contraction, isometric, isotonic, isokinetic contraction of muscle.	2
	Length tension and force velocity relationship of skeletal muscle	1
	Effect of training on skeletal muscle physiology	1 ½
5	Thermal Physiology	
	Significance of Thermal stress in Aviation	1
	Principle of homeothermy, heat balance equation	1
	Assessment of thermal stress, heat stress indices, cold stress indices	2
	Physiology of thermoregulation heat responses, cold responses	2
	Acclimatization to thermal stress	1
	Effects of extremes of thermal stress heat disorders, cold injuries	2
	Protective measures against thermal stress in aviation environment	2
6	Sleep and Circadian Physiology	
	Physiology of sleep and arousal	2
	Autonomic Nervous System	2
	Circadian rhythm	1
7	Renal Physiology	
	Fluid and electrolyte balance	1 ½
	Acid base balance	1 ½
8	Endocrine Physiology	
	Mechanism of hormone action	1
	Hypothalamo-hypophysial hormones	1
	Adrenal gland and Hypothalamo-hypophysial-adrenal axis	1
	Physiology of stress and stress markers	1
9	Physiology of Ageing	1
10	Space Physiology	
	Historical perspectives of Indian space research	1
	Cardiovascular changes in weightlessness. Acute induction, de-conditioning	2
	Musculo-skeletal changes in weightlessness	2
	Respiratory changes in weightlessness	1

	Physiology of neurovestibular system, Neuro-vestibular adaptation to weightlessness - Space Motion Sickness	2
	Human Performance Factors, Sleep and Chronobiology in space	1
	International Space station	1
	Ground simulation of hypo-gravity	1
	Countermeasures of preventing space Deconditioning	1
11	Biochemistry	
	Metabolism, Energy metabolism, Carbohydrate metabolism, Fat metabolism, Protein metabolism, Integration of metabolism	9
	Nutrition, General aspects, Aircrew nutrition and preflight meals	5
	Practicals (22)	
1	Determination of dynamic lung functions by single breath max expiratory effort method.	4
2	Evaluation of cardiovascular reflexes by a change of posture from supine to 70 degree head up tilt (HUT).	6
3	Assessment of thermal stress of a given environment and comment on its suitability for fighter flying.	3
4	Simulate the given environment (viz. Temperature dry bulb 45 degree C, RH 60 %) in a hot cockpit and calculate various heat stress indices.	3
5	Determination of heat strain on 1 hr exposure to a given simulated hot environment in hot cockpit and calculate body heat storage	3
6	Assessment of cardiovascular changes on 1 hr exposure to dry floatation	3
	HIGH ALTITUDE PHYSIOLOGY and HYPERBARIC MEDICINE (82)	
1	Historical perspective and Operational significance	1
	Atmosphere and acute altitude physiology	1
2	Respiratory Physiology in Flight.	
	Respiratory changes in flight situations	1
	Concepts of respiratory physiology in Hypoxia	2
	Requirements of oxygen, tissue metabolism, Alveolar Oxygen tension and its determinants	2
	Respiratory Physiology in Hypoxia	1
	Oxygen cascade- P_{AO_2} with altitude, oxygen dissociation curve and altitude	2
3	Acute Altitude Hypoxia	
	Hypoxia definition and classification	1
	Hypoxia in flight and aetiology of hypobaric hypoxia	1
	Respiratory response, breathing air, oxygen and during rapid decompression physiological equivalent lung altitudes	1
	Cardio vascular responses, general and regional	1
	Neurological effects of acute hypobaric hypoxia and performance changes	1
	Clinical features and stages of Hypoxia	1
	Factors affecting Hypoxia, Concept of TUC	2
	Prevention and acceptable limits of Hypoxia.	1
4	Prevention of Hypoxia	
	Oxygen concentration, flows, Cabin Pressurization, pressure and resistance	2
	Pressure breathing concepts	
	Pressure breathing assemblies	2
5	Oxygen Systems	
	General requirements	1
	Physiological requirements,	2
	Oxygen equipments	4
	Source, (LOX, GASOX, OBOGS), regulator and mask	2
	Passenger oxygen systems	1
	Oxygen masks	2
	Evaluation and testing of a/c oxygen system MIL stds and specs	3
6	Decompression sickness	
	Physiological considerations	3
	Clinical signs and symptoms	2

	Factors affecting DCS	1
	Treatment of DCS	2
	EVA and space station DCS	1
7	Rapid Decompression.	
	Physical and Physiological considerations	3
	RD and Oxygen design and evaluation	1
	Safety criteria and dangers	1
8	Aeromedical Problems in High Altitude operations	
	Helicopter flying in India	1
	Acclimatisation	1
9	Symposia	
	Oxygen equipment in the IAF	4
	Recent advances in High Altitude Physiology symposium and Hypoxia	4
	HBOT	4
10	Hyperbaric Oxygen Therapy	
	Physiological considerations	3
	HBO profiles clinical applications	2
	HBO facilities	1
	Oxygen toxicity	1
	HBO in the IAF	1
	Design of HBO Chambers and Safety standards	1
11	Space Medicine and Life Support System	
	Escape, Pressurization, Oxygen system, Air Conditioning and Clothing in spacecraft and during EVA	2
	Management of waste products	1
	Future concepts	2
	Historical perspective	1
	Countermeasures for space de conditioning	1
	Practicals (57)	
1	Decompression Chamber	15
2	Flying Clothing	15
3	Oxygen systems	18
4	Hyperbaric Oxygen	9
	Seminars, Reviews and Case presentations (18)	
1	Aeromedical problems of High Altitude	6
2	Beneficial effects of HBOT in various clinical conditions	6
3	Study and presentation of cases suitable for Hyperbaric Oxygen Therapy	6
	ACCELERATION and VESTIBULAR PHYSIOLOGY (54)	
1	Spatial Disorientation.	
	Historical perspective	1
	Orientation mechanisms	2
	Dynamics of SD	1
	Statistics	1
	Illusions	4
	Prevention	1
	New Concepts	1
	Training in SD simulator	2
2	Acceleration Physiology	
	Historical perspective	1
	Definitions Magnitude Direction	3
	G-LOC, A-LOC	2
	SACM	2
	Push-pull manoeuvres	3
	Super-maneuverability	3
	Need for acceleration in combat flying	1
3	Cardiovascular changes under +Gz	
	Circulation under gravitation system	2
	Effects on the heart	1
	Effects on Vision	1

	Effects on cerebral circulation	1
	Effects of Straining manoeuvre on the cardiovascular system	1
	Effects of Anti-G suit on CVS	1
4	Effects of PBG on CVS Respiratory Changes in Acceleration	1
	Effects on ventilation	1
	Effects on distribution of blood flow	1
	Effects on gas exchange and oxygen saturation	1
	Changes during PBG	1
	Changes during AGSM	1
5	Enhancement of +Gz Tolerance	
	Mechanical	1
	Physiological	1
	Centrifuge training	2
	Anti-G Valve	2
	Anti-Gz Suit	2
	PBG	2
	-Gz	1
	Gx	1
	Gy	1
	Symposia (24)	
1	G-LOC	4
2	Advances in Gz Protection	4
3	Advances in SD Prevention	4
4	Altered state of awareness due to +Gz and Loss of Situational Awareness and SD potential in operational fighter operations	4
5	Centrifuge Training in IAF vs. other Air Forces	4
6	Ground based SD training in IAF	4
	Practicals (108)	
1	Familiarisation with the Human Centrifuge and its control and monitoring system	6
2	Sizing and fitment and testing of Anti-G suit	6
3	Centrifuge training	12
4	Determination of relaxed and straining ROR tolerance	6
5	Protection afforded by AGSM	6
6	ECG changes during +Gz	12
7	Determination of SACM tolerance	6
8	Protection afforded by PBG	6
9	Familiarisation with closed loop control of the human centrifuge	6
10	Familiarisation with SD simulator	6
11	Demonstration of basic flight manoeuvres	12
12	Demonstration of illusions in passive mode	6
13	Demonstration of illusions in active mode	12
14	Familiarisation with MSD program	6

	HUMAN ENGINEERING (85)	
1	Human Engineering	
	Scope, definition and introduction to Human Engineering.	2
2	Control/Display Integration.	
	General criteria, position relationship, control display ratio etc	3
3	Visual Displays.	
	General trans-illuminated displays, scale indicators, CRT/LCD displays, Newer displays - HUD, HMD, HMSD, HDD / Projected Map Display	3
4	Audio Displays.	
	General characteristics, Audio warnings, S/N relationship, verbal warning signals, speech transmission, reception, speech intelligibility	3
5	Controls.	

	General rotary controls, linear controls, high force controls, miniature control touch screen controls, fly by wire, fly by night.	3
6	Anthropometry, Cockpit Ergonomics and Biomechanics.	
	Static and Dynamic Anthropometry, Goniometry, Dynamometry, Dynamic conventional and digital anthropometry, posture and seating, Women in Cockpit-Transport and Combat pilots.	4
7	Work space Design.	
	General, data standing operations seated operations, common working positions, standard console design, special purpose console design, ingress and egress safety.	3
8	Environment.	3
	Heating, ventilation and air conditioning, illumination, acoustic noise, vibration- HE aspects	
9	Human Factors (Aircrew)	
	STOL/ VTOL aircraft, Helicopters, ATC, Flight deck automation, Super Sonic Transport	3
10	Maintenance and Ground Personnel.	
	Ladders and ramps, manual material handling, work/rest cycles, strength and endurance, lifting tasks, carrying tasks, reducing risk of overexertion.	2
11	Human Error and Flight Safety.	
	General, types of human error, theories of accident causation, risk perception and warning).	4
12	Escape	
	Historical Aspects	1
	Unassisted Escape	1
13	Ejection and Restraint system	
	Ejection Seat Design Concepts	3
	Ejection system in various IAF aircraft	2
	Recent advances in ejection system	2
	Biodynamics of Spine in Ejection	1
	Injuries during ejection	2
	Care and disposal of ejectees	2
	Psychological problems in ejection	1
14	Space shuttle	
	Cockpit environment, Workspace layout and survival equipment. Layout of space craft/ space station	2
15	Aircraft accident investigation and reconstruction	4
16	Aviation Safety and Crew Performance Crash and Rescue	
	Crash worthiness	1
	General concepts of crash rescue set up	2
	Role of MO in crash and rescue	1
	Pre-accident plan	2
	Injury Protection	1
17	Survival	
	General concepts	1
	Contents of survival pack	1
	Survival situations: snow, desert, jungle, sea	4
18	Casualty Air Evacuation	
	Carriage of sick and disabled	2
	Cas-Evac capabilities of IAF aircraft	2
19	Human Factors in ac accidents	3
20	HFACS	3
21	Emerging concepts in Flight safety	1
22	A detailed study of successful flight safety programs	
	USAF	1
	US Navy	1
	Qantas	1
	Space shuttle	1
23	CRM	2
24	UAVs – Human factors	1

	Practicals (40)	
1	Aircrew-Aircraft Compatibility (Anthropometry)	9
2	Work Station Design	9
3	Assessment of orthopaedic and spinal disabilities	12
4	Survival Aids and Emergency Flying Rations	6
5	HF in accident investigation	4
	Demonstrations (51)	
1	Ejection seat pull out trials (HAL)	9
2	Types of ejection seat in IAF (ASTE, AF)	9
3	Personal Survival packs and their contents (ASTE AF)	6
4	Cockpit familiarisation (e.g. AN-32 simulator, Dornier, AVRO, Yelahenka)	6
5	Cockpit vision inside and outside the cockpit (ASTE, AF/ ADA(LCA) mockup)	6
6	Cas-Evac procedure (AF Stn Yelahenka)	6
7	Visit HAL airport and Yelahenka ATC	9
	PRACTICE OF AVIATION MEDICINE IN THE FIELD(15)	
1	Medical examination of aircrew – Annual	1
2	Preflight medical examination	1
3	Flying Clothing: Inspection, fitment, maintenance, quality assurance, defect report	2
4	Oxygen systems: Inspection, maintenance	1
5	CoI into aircraft accidents, HFACS proforma, ejection proforma, F-1956	2
6	Attending to aircraft emergencies, crash rescue organization	3
7	Pre Accident plan	2
8	Casualty evacuation	3
9	Demonstrations on operational aerospace medicine in field	21
	CIVIL AVIATION MEDICINE (19)	
1	Flight duty time limitation	2
2	Selection and Training	2
3	Traffic and Approach	1
4	Airline catering	2
5	Carriage of sick and disabled	3
6	Epidemiological and Immunological problems	2
7	International health organisation	1
8	Civil air organisation in India	1
9	Role of Aviation Medicine Specialist in Civil Aviation	1
10	Concept of AME	1
11	Types of licenses	1
12	Relevant issues in licensing	1
13	Forms	1
	PREVENTIVE AND SOCIAL MEDICINE (26)	
1	Environment and Health	5
	Water pollution	
	Purification	
	Sanitation of Stations, Air crew Cafeterias	
2	Occupational Health	3
	Noise prevention, Radiation, Vibration	
	Toxicology	
	Occupational hazards of ground crew	
3	Health Education and Communication	2
	Principles, Content, Practice	
4	N B C Warfare	3
5	Non-Communicable Diseases	3
	Cancer	
	CAD, Obesity, Diabetes	
	Accidents	
6	Research Methodology	2
7	Family Welfare	1
8	Immunization	1
9	Aerial Hygiene and sanitation	2
10	Role of AvMed Spl in control of non-communicable diseases in an AF Stn	1

11	Prevention of communicable diseases esp malaria	1
12	HIV/AIDS	2
	MEDICINE (82)	
1	ECG	
	Normal ECG and normal variants	2
	Disorders of conduction Ischemic Heart Disease	4
	Rhythm Disorders	2
	Hypertrophy	2
	Exercise Electrocardiography	3
2	Cardiovascular System.	
	Cardiovascular investigations	2
	Ischemic heart disease	2
	Hypertension	1
	Heart failure	2
	Cardiomyopathy	1
	Valvular Heart Disease	1
	Disease of the pericardium	1
	Miscellaneous heart conditions	1
	Congenital heart disease in adults	1
	Heart disease in India and the IAF	1
	Principles of Aero-medical disposal of CVS disease	1
	Recent advances in CVS diseases	1
3	Respiratory System	
	Investigation of the respiratory system	2
	Bronchial asthma	2
	Upper respiratory disease	½
	Disease of the Pleura	1
	Pneumonias	½
	Tuberculosis	2
	Respiratory disease in India and in IAF	1
	Aero-medical disposal of respiratory disease	1
	Recent Advances	1
4	Central Nervous System	
	Neurological Investigations	2
	Epilepsy Episodic Unconsciousness	1
	Tropical Neurology	1
	Common Neurological disease of Aviation significance	2
	Head Injuries	2
	Recent Advances	1
5	Gastroenterology and Hepatology	
	Functional Anatomy and physiology of the GE and Biliary system	4
	Investigation of GE and hepatic system	3
	Common GE disorders of aviation significance	2
	Viral Hepatitis	2
	Aero-medical disposal	1
	Recent advances	1
6	Metabolic Disorders	
	Investigations of metabolic disorders	2
	Thyroid disorders	2
	Diabetes Mellitus	4
	Obesity	2
	Other endocrine disorders and aero-medical disposal	2
	Recent advances	1
7	Renal Diseases	
	Functional anatomy and physiology	1
	Investigation of renal disease	1
	Overview of renal diseases	2
	Recent advances	1
8	Rheumatological Disorders	1
	Clinical Immunology (Immunological stresses)	1

	Clinical Genetics (Recent advances)	1
9	Clinics in the Department	52
	AVIATION OPHTHALMOLOGY (15)	
1	Applied anatomy and physiology	1
2	Optics refraction and refractive errors	2
3	Binocular vision, muscle balance	2
4	Cataract surgery and phaco-emulsification	1
5	Common eye disorders	2
6	LASIK and other refractive surgeries	1
7	Contact lenses	1
8	UIOLs and aviation	1
9	Visual problems in aviation	4
10	Ophthalmology Clinics (Discussion of various conditions - Theory)	10
11	Ophthalmology Clinics (Discussion of various conditions -Practicals)	5

	AVIATION OTORHINOLARYNGOLOGY (19)	
1	Applied Anatomy and Clinical examination	1
2	Applied Physiology: Hearing, Balance and SD	1 ½
3	Audiological Investigation	
	Audiometry, Tympanometry, Tone Decay, Recruitment, Evoked Response Audiometry e.g. BERA, EChoG	1
4	Vestibular Investigation	
	All vestibular tests special reference to Caloric Test and ENG	1
5	Barotrauma	1
6	Management of Otitis Media	
	Etiology and types, Principal of management, Disposal of various ear diseases e.g. Traumatic perforation, OME	1
	Otosclerosis, Facial Nerve Palsy and surgeries e.g. Myringotomy, Myringoplasty, Tympanoplasty, Cortical mastoidectomy, MRM and RM.	1
7	Management of SNHL	
	Etiology, Investigations, Principle of treatment and Disposal	1
	Aetio-pathogenesis and Management of NIHL	1 ½
8	Voice production and Speech Disorders	
	Mechanism of Voice production, Common Speech disorders mainly Hoarseness of Voice and Stammering.	1
9	Management of Vertigo	
	Etiology, Relevance of other related terms, Protocol of investigation, Principal of management and Disposal.	1
10	Motion Sickness	1
11	Management of Nasal Allergy and Polyposis	
	Aetio-pathogenesis, Principle of management and Disposal.	1
12	Common ENT diseases	
	Wax, Furunculosis, Traumatic perforation, OME, Septal perforation, Epistaxis, Sinusitis, Chronic Tonsillitis, Foreign bodies in ENT and Facial trauma.	1
13	Recent Advances in ENT	1
14	ENT standards and evaluation	
	Armed forces Pilot At the time of Commissioning and Regular (Annual/periodic/Special medical exam); Civil Pilot	1
15	Hearing Conservation Program	2
16	Clinics in the Department	15
	NEUROPSYCHIATRY (36)	
1	Symptoms and signs in Psychiatry	1
2	Psychiatric interview and history taking	1
3	Schizophrenia (including paranoid states)	1
4	Mood disorders	1
5	Neurosis – anxiety, phobia, OCD, somatoform disorders	1
6	Stress related disorders	1
7	Dementia	1

8	Behavioural syndromes (sleep disorders, psychosexual disorders)	1
9	Suicide prevention	1
10	Psychiatric emergencies	1
11	Aviation related topics – head injury; air sickness; fear of flying; drugs, alcohol and the aviator	3
12	Personality disorders	1
13	Somatic therapies (pharmacotherapy)	1
14	EEG recording and interpretation	10
15	Case discussions	10
16	Legal issues in Psychiatry and mental health care, AFMSF-10 and its implications	1
17	Clinics in the Department	10

	AVIATION PSYCHOLOGY (32)	
1	Introduction to Aviation Psychology: Role and Scope	1
2	Personality	
	Theories of personality	2
	Its application in aviation	2
3	Cognitive Processes	
	Attention	1
	Perception	1
	Memory	1
	Decision making	1
4	Intelligence	1
5	Aircrew Selection	
	Present methods	3
6	Learning	
	Principles of learning	1
	Application in training	1
7	Emotions	1
8	Motivation	1
9	Psychological stress in flying	8
10	Crew resource management	1
11	Psychological considerations of Space Missions	1
12	Suicidal behavior	3
13	Behavior therapy	2
	Practical (10)	
	Personality Tests for Clinical Evaluation	
1	Rorschach Ink Blot Test	5
2	16 PF Test	3
3	EPI and MMPI	1+1
	AVIATION PATHOLOGY (23)	
1	Introduction and scope of Av Pathology	1
2	Fatal aircraft accident investigation introduction and Medico legal aspects	1
3	Post mortem examination in fatal air crash and portable autopsy kit	2
4	Collection, preservation and Dispatch of specimen	2
5	Crash injuries - type, classification, causes analysis and prevention	1
6	Timings of injuries including embolic phenomenon	2
7	Histological findings and accident reconstruction	1
8	Pre-existing disease and accident causation	1
9	Role of aviation pathology in fatal aircraft accident investigation and analysis of autopsy finding and accident reconstruction	1
10	Investigations and diagnostic criteria of diabetes mellitus	1
11	Intoxication: Alcohol, CO, drugs, etc	1
12	Current techniques (a) Chromatography: general principles and its role in Aviation Pathology (b) Frozen section and its interpretation (c) Molecular biology	3
13	Liver Function Test, Thyroid function test, Renal function test	3
14	Investigations of haematological disorders (anaemia, leukaemia, bleeding)	2

	diathesis)	
15	Identification of avian blood in aircraft accidents	1
	Practical (30)	
1	Hematology	4
	Hemoglobin estimation	
	Staining of blood smear and differential counts	
	Total counts - WBC, RBC, Eosinophils and platelets	
2	Urine Analysis	1
3	Chemical Pathology	4
	Principals of auto-analyser and spectrophotometer	
	Blood sugar (including GTT and Glycosylated Haemoglobin)	
	Blood urea and creatinine	
	Cholesterol, Lipid profile	
	Bilirubin, SGOT, SGPT, alkaline phosphatase	
	HPLC, Gas chromatography	
4	Carboxy haemoglobin estimation	1
5	Alcohol estimation/interpretation	1
6	Lactic acid and cyanide estimation	1
7	Demonstration of post mortem at CHAFB	4
8	Collection, preservation and dispatch of specimen, Histological findings and accident reconstruction	4
9	Role of aviation pathology in fatal aircraft accident investigation and analysis of autopsy finding and accident reconstruction	2
10	Identification of avian blood in aircraft accident	4
11	Clinical Pathology	4
	Liver function tests	
	Renal function tests	
	Investigation for diabetes	
	Cardiovascular screening	
	RADIOLOGY (20)	
1	Functional Anatomy of the spine	2
2	Radiology Of The Spine	3
3	Spinal Disorders	2
4	Skeletal Trauma (Including Head Injury)	2
5	Radiology of the CVS	1 ½
	Radiology of the Respiratory System	1 ½
6	Radiology of the Renal System	1 ½
	Radiology of the GIT	1 ½
7	Recent advances	2
8	Evaluation of Ejection injuries	3
9	Demonstrations	40

FIRST YEAR SCHEDULE

Calendar Year	-	52 weeks
Yearly Leave	-	4 weeks
Closed Holidays	-	3 weeks

First Year:

Academics (Available Days)	-	45 weeks
(52-7weeks) X5=225 days		
Total hrs for academics (7 hrs per day)	-	1575 hrs
(225 days×7 hrs)		

Schedule:

Theory	-	714 hrs
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Practical (Incl. demonstration, clinics)	-	542 hrs
Seminars, Symposia, Reviews, Case Presentations	-	250 hrs
Open/Guest Lectures	-	69 hrs
MD Dissertation: Preparation and submission of Synopsis		
Total	-	1575 hrs



Postgraduate Students Appraisal Form

Pre / Para /Clinical Disciplines

Name of the Department/Unit :

Name of the PG Student :

Period of Training : FROM.....TO.....

Sr. No.	PARTICULARS	Not Satisfactory			Satisfactory			More Than Satisfactory			Remarks
		1	2	3	4	5	6	7	8	9	
1.	Journal based / recent advances learning										
2.	Patient based /Laboratory or Skill based learning										
3.	Self directed learning and teaching										
4.	Departmental and interdepartmental learning activity										
5.	External and Outreach Activities / CMEs										
6.	Thesis / Research work										
7.	Log Book Maintenance										

Publications

Yes/ No

Remarks*

*REMARKS: Any significant positive or negative attributes of a postgraduate student to be mentioned. For score less than 4 in any category, remediation must be suggested. Individual feedback to postgraduate student is strongly recommended.

SIGNATURE OF ASSESSEE

SIGNATURE OF CONSULTANT

SIGNATURE OF HOD