UNIVERSITY OF KARACHI

Self-Assessment Report

Institute of Space and Planetary Astrophysics
University of Karachi

Submitted to

Quality Enhancement Cell
University of Karachi

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PROGRAMME TEAM

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INTRODUCTION

We are now in an era where humanity is reaching to the end points of our solar system through probes like Voyager 1, sent decades ago by NASA with messages from our civilization. Humanity is also endeavoring to colonize other planets through multi-national projects. We are also looking deepest into the space for new stars, galaxies and even to some of the earliest times after the creation of our universe through cosmic microwave background probes like Planck.

Advancements in space science and technology will not only help in discovering new things about our universe but through scientific capacity building, technical human resource development and spin-off technologies, we can see some real economic and social development. For instance, Space Technology is being used in many fields such as for planning of urban development, monitoring natural disasters and so on.

The Institute of Space and Planetary Astrophysics (ISPA) was established as an autonomous Research Institute of the University of Karachi in 1994 for producing human resource to cater to the needs related to the field of Space Science and Technology via teaching and research. This almost two-decade long journey of ISPA is a modest attempt at evolving practices which reflect a pursuit of the "Scientific Method" towards the solution of the 'indigenous' problems of the contemporary Pakistan as also global society.

ISPA has collaboration with Pakistan Space Agency SUPARCO, Centre for Astrophysics and Supercomputing, Swinburne University of Technology, Australia and School of Marine and Atmospheric Sciences, Stony Brook University, NY, USA. The Journal of GeoSpace Science is also being published by ISPA. The journal covers a wide range of topics related to Geospace sciences.

Professor Dr. Muhammad Jawed Iqbal

Director

Institute of Space and Planetary Astrophysics

CRITERION-1

PROGRAMMEMISSION, OBJECTIVES AND OUTCOMES

Criterion-1: Programme Mission, Objectives and Outcomes

Institute's Vision

The Institute aims at producing human capital to cater to the needs related to the field of Space Science and Technology via teaching and research.

Institutional Mission

The principal aim of the Institute is to provide education in Astrophysics, Atmospheric Physics, Remote Sensing and GIS, Satellite Orbitography and Communication, and Aerospace Studies for developing indigenous research and R&D capability**.**

Programme Mission (Graduate Programme in Space Science and Technology)

The Institute also offers admission in the M.Phil. and Ph.D. programmes. They aim at producing research expertise which can help to solve indigenous problems related to Space Science and Technology.

Standard 1-1: The Programme must have documented measurable objectives that support college and Institution mission statements.

Programme Objectives (M.Phil.)

- To understand the current advancement in the fields of Space Science
- To create knowledge of Space Science
- To develop new space technology

Table: Programme Objectives Assessment

S. No.	Objectives	How Measured	When Measured	Improvement Identified	Improvement Made
1	To understand the current advancement in the fields of Space Science	By teaching different courses of Space Science	During semester exam		
2	Creation of knowledge	By carrying out research work and writing thesis	Publication of research articles		

Standard 1-2:The programme must have documented outcomes for graduating students. It must be demonstrated that the outcomes support the programme objectives and that graduating students are capable of performing these outcomes.

PROGRAMME OUTCOMES

After completion of the __M.Phil. / Ph.D.__ Degree, the students shall be able to:

- Know the current advancements in the fields of Space Science
- carry out research work in the fields of Space Science

Standard 1-3: The results of programme's assessment and the extent to which they are used improve the programme must be documented.

a) Strengths and Weaknesses of the Programme

i) Strengths:

- Highly Qualified Faculty
- Applied Curriculums
- Astronomical Observatory
- Basic Electronics Lab
- Computational Lab
- Remote Sensing & GIS Lab

ii) Weaknesses

- We have shortage of teaching staff and non-teaching staff
- We need some latest equipment to conduct lab classes.

b) Future Development Plans

- Development of Satellite Communication Lab
- Development of Solar-Spectroscopy Lab

Standard 1-4: The department must assess its overall performance periodically.

a) Student Enrolment

S. No	Year	Degree			
1	2013				
2	2014				
3	2015				

b) Student/Faculty Ratio 1:50

c) i) Time for Bachelors

ii) Time for M.S

iii) Time for Ph.D

d) The average student grade point (CGPA)

e) Student/Faculty Satisfaction

CRITERION-2

CURRICULUM DESIGN AND ORGANIZATION

Criterion-2 Curriculum Design and Organization

M. Phil. (Space Science) Credit Hours:

Minimum credit hours earned by a student shall be 30 for the award of M.Phil. degree in Space Science.

S. No.	Semester	No. of Courses	Type of Courses	Credit Hours
01	First Semester	04	3 Compulsory 1 Elective	12
02	Second Semester	04	3 Compulsory 1 Elective	12
03	M.Phil. Thesis	---	Compulsory	06
			Total Credit Hours	**30**

Ph.D. (Space Science) Credit Hours:

Minimum credit hours earned by a student shall be 36 for the award of Ph.D. degree in Space Science.

S. No.	Semester	No. of Courses	Type of Courses	Credit Hours
01	First Semester	03	1 Compulsory 2 Elective	09
02	Second Semester	03	1 Compulsory 2 Elective	09
03	Ph.D. Thesis	---	Compulsory	18
			Total Credit Hours	**36**

Course Structure of M. Phil. (Space Science)

M.Phil students are required to complete 24 credit hours courses before submission of M.Phil thesis in two semesters. Three courses are compulsory. One course in each semester is electives.

1st Year (Semester I)

S. No	Course Code	Course Title
1	SPA 701	Research Methodology (3+0)
2	SPA 703	Celestial Mechanics (3+0)
3	SPA 705	Computational Fluid Dynamics (2+1)
4		Option-I

Optional Subjects for First Semester (Option-I)

SPA 707: Relativistic Physics (3+0)
SPA 709: Global Navigation Systems (3+0)
SPA 711: Spaceflight Technology Essentials (3+0)
SPA 713: Ocean Wave Dynamics (3+0)
SPA 715: Modeling and Simulation (2+1)
SPA 717: Geomagnetism and Seismology (3+0)
SPA 719: Climate Change and Modeling (3+0)

1st Year (Semester II)

S. No	Course Code	Course Title
1	SPA 702	Geo-informatics (2+1)
2	SPA 704	Space Flight Dynamics (3+0)
3	SPA 706	Stellar Astrophysics (3+0)
4		Option-II

Optional Subjects for Second Semester (Option-II)

SPA 708: Quantum Physics (3+0)
SPA 710: Space Antennas (3+0)
SPA 712: Missile Guidance and Control Systems (3+0)
SPA 714: Renewable Energy Resources (3+0)
SPA 716: Numerical Weather Forecasting (3+0)
SPA 718: Fundamentals of Air Traffic Control (3+0)
SPA 720: Space Physics (3+0)
SPA 722: Modern Cosmology (3+0)
SPA 724: Observational Astronomy (2+1)
SPA 726: Advanced Ionospheric Physics (3+0)

COURSE STRUCTURE OF Ph.D. (SPACE SCIENCE)

Ph.D. students are required to complete 18 credit hours courses before submission of Ph.D. thesis in two semesters. Two courses (viz. Research Seminars and Seminars on Current Advances in the Discipline) are compulsory. Two courses in each semester are electives.

1st Year (Semester I)

S. No	Course Code	Course Title
1	SPA 801	Research Seminars (3+0), Compulsory
2	Option-I	
3	Option-II	

Optional Subjects for First Semester (Option-I & II)

01. SPA 803: Advanced Numerical Computing (2+1)
02. SPA 805: Spacecraft System Design (3+0)
03. SPA 807: Space Plasma Physics (3+0)
04. SPA 809: Satellite Communication Engineering **(**3+0)
05. SPA 811: Spatial Decision Support for Planning and Crisis Management (2+1)
06. SPA 813: Optimal Control Theory (3+0)
07. SPA 815: Solar Physics (3+0)
08. SPA 817: Atmospheric Turbulence (3+0)
09. SPA 819: Hydrology (3+0)
10. SPA 821: Galaxy Formation and Evolution (3+0)
11. SPA 823: Topics of Special Interest-I

1st Year (Semester II)

S. No	Course Code	Course Title
1	SPA 802	Seminars on Current Advances in the Discipline (3+0), Compulsory
2	Option-III	
3	Option-IV	

Optional Subjects for Second Semester (Option-III & IV)

01. SPA 804: Spatial Data Analysis using MATLAB (2+1)
02. SPA 806: Radiowave Propagation (3+0)
03. SPA 808: Radio Astronomy (3+0)
04. SPA 810: Small Satellite Engineering and Application (3+0)
05. SPA 812: Aerodynamics (3+0)
06. SPA 814: Space Weather (3+0)
08. SPA 816: Mesoscale Modeling (3+0)
09. SPA 818: Space Biology and Microgravity Sciences (3+0)
10. SPA 820: Environmental Physics (3+0)
11. SPA 822: Cartography and Data Visualization (2+1)
12. SPA 824: Topics of Special Interest-II

Standard 2-1: The Curriculum must be consistent and support the programme's documented objectives

The following table manifests how the programme content (Courses) meets the Programme Objectives.

Courses	**Programme's Objectives**			
	1	**2**	**3**	**4**
Major Courses				
Elective Courses				
Practical (Field and Lab)				
Thesis/Dissertation				

Standard 2-2: Theoretical background, problem analysis and solution design must be stressed within the programme's core material.

The following table indicates the elements covered in core courses:

Elements	**Courses**
i) Theoretical Background	All courses offered by the Department
ii) Problem Analysis	All courses of the Department Elective Courses Internships/Thesis/Dissertation
iii) Solution Design	All courses of the Department Elective Courses Internships/Thesis/Dissertation

Standard 2-3: The curriculum must satisfy the core requirements for the programme, as specified by the respective accreditation body.

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Standard 2-4: The curriculum must satisfy the major requirements for the programme, as specified by the respective accreditation body/council.

The curriculum adopted by Institute of Space & Planetary Astrophysics (ISPA) has been approved by Academic Council, competent authority and statutory bodies of University of Karachi.

2-5: The curriculum must satisfy the general education, arts and other discipline requirements for the Programme as specified by the accreditation body.

Standard 2-6: Information technology component of the curriculum must be integrated throughout the programme.

Following courses cover Information Technology component of the Curriculum of M.Phli / Ph.D programme in such a way that students are advised to give all seminars on multimedia presentation and any type of computation involved has to be performed using some computational software / programming.

Standard 2-7: Oral and written communication skills of the student must be developed and applied in the programme.

In every semester there are such courses that require every student to give full standalone presentation in the class. This helps students to gain confidence to present their research in most appropriate manner and also to conduct independent research. It is mandatory for Ph.D students and advised to M.Phil students to at least get one paper published in some reputable journal related to their research topic.

CRITERION-3

LABORATORY AND COMPUTING FACILITIES

CITERION-3: Laboratory and Computing Facilities

Laboratory Facilities

(A) ISPA Observatory
(B) Electronics Lab Lab
(C) Remote Sensing & GIS Lab

Computer Facilities

(A) Computer Labs

Internet Facility

Internet facility is compromised. It is available off-n-on.

Standard 3-1: Laboratory manuals/ documentation instruction for experiments must be available and readily accessible to faculty and students

Standard 3-2: There must be adequate support personnel for instruction and maintaining the laboratories.

A request has been made to university to increase number of laboratory staff.

Standard 3-3: The University computing infrastructure and facilities must be adequate to support programme's objectives

i) Computing Facilities

We do lack some physics practical instruments required in seventh and eight semester of our space science under graduation programme.

We are also in need of more personal computer to meet the student-computer ratio which is at present 4:1.

ii)Multimedia

We do have two multimedia at our facility

iii) Website

We do have our website linked with University of Karachi Website http://www.uok.edu.pk
As Institute of Space and Planetary Astrophysics (ISPA)

CRITERION-4

STUDENT SUPPORT AND ADVISING

Criterion-4 Student Support and Advising

The Institute have satisfactory support for students to complete the programme according to schedule and the students have ample opportunity to interact with their teachers of respective courses to receive timely advice about program requirements and career development.

Standard 4-1: Courses must have been offered with sufficient frequency and number for students to complete the programme in a timely manner.

Program	Classes per Week	Practical Classes per Week
M.Phil & Ph.D	Three lectures per week for 3+0 course. Two lectures per week for 2+1 course.	Practical sessions of three hours per week for courses which include practical.

Standard 4-2: Course in the major must be structured to ensure effective interaction between students, faculty and teaching assistants.

Course allocation is made in the meeting of the faculty members. There is also provision for Tutorial Classes for greater interaction between students and teachers.

Standard 4-3: Guidance on how to complete the programme must be available to all students and access to academic advising must be available to make course decisions and career choices

- The Director of the Institute nominates a faculty member as 'Students Advisor' who is available to all students for course decision and career choices. The Student Advisor and the Director help the students by providing information regarding career opportunities available for them.
- The Director places on the Notice Board the Call for papers for different related conferences, opportunities of job, membership in technical and professional societies as and when received.

CRITERION-5

PROCESS CONTROL

Criterion-5: Process Control

Standard 5-1: The process by which students are admitted to the programme must be based on quantitative and qualitative criteria and clearly documented. This process must be periodically evaluated to ensure that it is meeting its objectives.

Eligibility for Admission to M. Phil. Program:

The students of the following fields are eligible for admission in M. Phil. (Space Science):

- M.Sc. (Space Science), M.Sc. (Physics with specialization of Space Science), M.Sc. (Applied Mathematics with Astronomy).
- B.S. (Space Science), B.S. (Physics with Space Science), B.S. (Applied Mathematics with Astronomy).

Eligibility for Admission to Ph.D. Program:

The students of the following fields are eligible for admission in Ph.D. (Space Science):

M. Phil. / MS (Space Science)

Standard 5-2: The process by which students are registered in the programme and monitoring of students progress to ensure timely completion of the programme must be documented. This process must be periodically evaluated to ensure that it is meeting its objectives.

Courses are completed timely; Monitoring procedures for students are documented regularly. Regular teaching staff is held meetings. Additional classes are adjusted, immediately for any unscheduled closure. Midterm tests are conducted during 8^{th} week where necessary. Half of the course should be covered by midterm test.

Standard 5-3: The process of recruiting and retaining highly qualified faculty members must be in place and clearly documented. Also processes and procedures for faculty evaluation, promotion must be consistent with institutional mission statement. These processes must be periodically evaluated to ensure that it is meeting with its objectives.

HEC rules with approval by the University Syndicate are applied for appointment.

Teachers are encouraged to enhance their qualifications.

Appointments/ Promotion Procedure

Basic Pay Scale (BPS)

Appointments are based on HEC rules given below.

a. Lecturer (BPS- 18):

Minimum Qualification

Bachelor's Degree (first Class) in the relevant field with no 3rd division in the Academic Career from HEC recognized University/Institution. During the next two years (i.e. until June 30th, 2008) if no candidate is available without 3rd division in the academic record, then the University may forward the case for appointment of a selected candidate to the HEC for consideration and approval.
No experience required

b. Assistant Professor (BPS- 19):

Minimum Qualification

Ph.D. in the relevant field from HEC recognized University/Institution, No experience required.

OR

Master's Degree (foreign) or M.Phil. or equivalent degree in the relevant field after 18 years of education as determined by the HEC in the subject from HEC recognized University/Institutions, with 4 years teaching/research experience in a recognized university or a postgraduate Institution or in National or International Organization.

c. Associate Professor (BPS- 20)

Minimum Qualification

Ph.D. in relevant field from HEC recognized University / Institution.

Experience

10-years teaching / research in HEC recognized University or a Postgraduate Institution or Professional Experience in the relevant field in a National or International Organization.

OR

5-years post Ph.D. teaching/research experience in HEC recognized University or a post-graduate Institution or professional experience in the relevant field in a National or International Organization.

Minimum Number of Publications

10 research publications (with at least 2 publications in last 5 years) in internationally abstract Journals recognized by the HEC.

d. Professor (BPS-21)

Minimum Qualification

Ph.D. from HEC recognized Institution in relevant field.

Experience

15-years teaching / research experience in HEC recognized University or post-graduate Institution or professional experience in the relevant field in a National or International Organization.

OR

10-years post-Ph.D. teaching/research experience in a recognized University or a post post-graduate Institution or professional experience in the relevant field in a National or International Organization.

Minimum Number of Publications

15 research publications in internationally abstracted Journals recognized by the HEC.

PEC Registration is essential for all appointments.

Basis for Appointments / Promotions (under tenure track system)

Four main areas where a candidate is evaluated for Tenure Track Scheme;

- Teaching
- Research
- Service
- Personal Characteristics

General Criteria for Appointment on TTS

All faculty members in any discipline are eligible to apply for appointment provided they fulfill the following minimum eligibility conditions;

a. Assistant Professor Minimum Qualification

PhD from a recognized University with excellent communication/presentation skills.

b. Associate Professor Minimum Qualification

PhD with 6 years post - PhD teaching / research experience in a recognized University.

Minimum Number of Publications

10 research articles published in journals having impact factor. c. Professor:

Minimum Qualification

PhD with 11 years post-PhD teaching / research experience from a recognized University.

Minimum Number of Publications:

15 research articles published in journals having impact factor.

Faculty Evaluation Process University rules are adopted.

Standard 5-4: The process and procedure used to ensure that teaching and delivery of course material to the students emphasizes active learning and that course learning outcomes are met. The process must be periodically evaluated to ensure that it is meeting its objectives.

The methodology to ensure teaching and delivery of course material is as follows:

a. Schedule/ time table is followed by all faculty members
b. Director of the Institute regularly gets feedback from the students during the semester.

Standard 5-5: The process that ensures that graduates have completed the requirements of the programme must be based on standards, effective and clearly documented procedures. This process must be periodically evaluated to ensure that it is meeting its objectives.

a) The department ensures that the students are punctual and fulfill the attendance requirement i.e. 75%.

b) Promotions to the next year is restricted to only those who have cleared more than 80% courses.

c) Exams by the students are regularly held.

CRITERION-6

FACULTY

Criterion-6 Faculty

The faculty members of the Institute makes harmonies combination of highly experienced people in different domains of space science and highly experienced teachers having the necessary technical depth to support the program. Teachers attempt to cover the curriculum adequately and in case of need conduct extra classes

Standard 6-1: There must be enough full time faculty who are committed to the programme to provide adequate coverage of the programme areas / courses with continuity and stability. The interest of all faculty members must be sufficient to teach all courses, plan, modify and update courses. The majority must hold a Ph.D. degree in the discipline.

The Institute is currently having the services of 6 regular faculty members and 4 full-time cooperative teachers. Three members are Ph.D. and one is M. Phil and two are enrolled in M. Phil.

Standard 6-2: All faculty members must remain current in the discipline and sufficient time must be provided for scholarly activities and professional development. Also, effective programmes for faculty development must be in place.

At the institute there is a regular annual event named as "World Space Week". In this a two day National Conference is arranged in some current topic related to space science and its application. The faculty members are encouraged to participate in this annual regular event which is there since 2012.

Standard 6-3: All faculty members should be motivated and have job satisfaction to excel in their profession.

To help the faculty of the Institute in their progress to excel in their profession, an effort is made to implement following strategies:

i) The institute ensures fair, timely selection, appointment/ promotion as per HEC criteria. Posts have been advertised and shall be fulfilled through the Selection Board shortly.

Good working environment exists for teaching and innovative technology programmes.

CRITERION-7

INSTITUTIONAL FACILITIES

Criterion-7 Institutional Facilities

Standard 7-1: The Institution must have the infrastructure to support new trends in learning such as E-learning.

a) Seminar library and Internet Facility

Seminar library has around 500 books .Effort is made to acquire latest books. Subscription to at least four international level space science journals is required. The institute has inadequate internet facility which needs to b improved.

b) Main Library

Faculty members and students of the institute are allowed to use the main Library which has extended working hours. The main library provides the following services;

i. Course books
ii. Digital library having access to journals and E-books

Standard 7-2: The library must possess on up-to-date technical collection relevant to the programme and must be adequately staffed with professional personnel.

New books are regularly purchased. The seminar librarian holds Masters of Library Science (M.L.S) degree.

Standard 7-3: Class rooms must be adequately equipped and offices must be adequate to enable faculty to carry out their responsibility.

Classrooms

Teachers are required to take extra classes in order to get the course completions. Teachers have access to overhead projectors and multimedia.

The institute faces acute space shortages in taking makeup classes.

Faculty Offices

The institute is short of space to adequately accommodate its faculty and administrative staff. A separate building for department is required.

CRITERION-8

INSTITUTIONAL SUPPORT

Criterion-8 Institutional Support

The institution's support for the program is sufficient enough to provide an environment in which the program can achieve its objectives and retain its strength. However, financial resources are required to meet the programme's objectives.

Standard 8-1: There must be sufficient support and financial resources to attract and retain high quality faculty and provide the means for them to maintain competence as teacher and scholars.

HEC rules may be made more attractive for highly qualified professional teachers.

Standard 8-2: There must be an adequate number of high quality graduate students, research assistants and Ph.D. Students

Degree Programme	Years		
	2014	2015	2016
M.Phil.			
Ph.D			
Research/ Teaching Assistants			

Student/Faculty Ratio (for the last three years)

Max- 3:1, Present- 2:1

Standard 8-3: Financial resources must be provided to acquire and maintain library holding, laboratories and computing facilities.

The University of Karachi provides financial resources to maintain library and computing facilities. The institute, however, is not having the separate fund of its own to maintain and upgrade its library and computing facilities. HEC is also requested to provide additional financial resources for further strengthening of the institute of Space and Planetary Astrophysics (ISPA)

Faculty CVs

Faculty Members of Institute of Space & Planetary Astrophysics (ISPA)- 2017

Name	Designation	Joining Date	Details of Qualification			Specialization	Experience Teaching (Total) Years
			Degree	Year	Institution		
1. Muhammed Jawed Iqbal	Director & Professor	Feb 2013	Ph.D M.Phil	2006 1990	Uok Uok	Simulation, Gravitation, Atmospherics	20 (20)
2. Mirza Jawwad Baig	Assistant Professor	April 2012	Ph.D M.Phil	2015 2006	Uok Uok	Computer Simulation, Atmospherics	5.5 (18)
3. Naeem Sadiq	Assistant Professor		Ph.D M.Phil				
4. Fayyaz-ur-Rasheed	Lecturer						
5. Muhammad Anas Qureshi	Lecturer						
6. Muhammad Saleem Khan	Lecturer						

Survey's Results