



کراچی یونیورسٹی

**University of Karachi**  
**Department of Mathematics**



**UNIVERSITY OF KARACHI**

University of Karachi, largest in the country in terms of student enrolment and number of PhD's produced, is located in the heart of Karachi, the financial and the business center of Pakistan. The University offers baccalaureate to doctoral and post-doctoral programs in a wide range of subjects. With prestigious institutions like, the HEJ Research Institute of Chemistry and the Applied Economic Research Center, University of Karachi is rated as the best public-sector university in the country. With a campus spanning over 1200 acres the university offers a breathtaking view and pollution-free environment if one wants to get away from smog of the city.

Table 1. New branches of mathematics introduced by faculty of Department of Mathematics

#	Name of Branch	Date Introduced	First Mention
01	Anthromathematics	March 22, 2010	<a href="http://www.ngds-ku.org/Presentations/Firdous.pdf">http://www.ngds-ku.org/Presentations/Firdous.pdf</a>
02	Astromathematics	October 8, 2012	<a href="http://www.ngds-ku.org/Presentations/ISPA.pdf">http://www.ngds-ku.org/Presentations/ISPA.pdf</a>
03	Anthropology	December 27, 2012	<a href="http://www.ngds-ku.org/Presentations/BZU1.pdf">http://www.ngds-ku.org/Presentations/BZU1.pdf</a>
04	Condensed-Matter Math.	December 28, 2012	<a href="http://www.ngds-ku.org/Presentations/BZU.pdf">http://www.ngds-ku.org/Presentations/BZU.pdf</a>
05	Anthroalgebra	April 10, 2013	<a href="http://www.ngds-ku.org/Presentations/AMTM.pdf">http://www.ngds-ku.org/Presentations/AMTM.pdf</a>
06	Anthrogeometry	April 10, 2013	<a href="http://www.ngds-ku.org/Presentations/AMTM.pdf">http://www.ngds-ku.org/Presentations/AMTM.pdf</a>
07	Anthrodynamics	April 10, 2013	<a href="http://www.ngds-ku.org/Presentations/AMTM.pdf">http://www.ngds-ku.org/Presentations/AMTM.pdf</a>
08	Anthroimaging	September 5, 2013	<a href="http://www.ngds-ku.org/Presentations/Scan.pdf">http://www.ngds-ku.org/Presentations/Scan.pdf</a>
09	Sport Mathematics	May 17, 2014	<a href="http://www.ngds-ku.org/Presentations/Sport_Mathematics.pdf">http://www.ngds-ku.org/Presentations/Sport_Mathematics.pdf</a>
10	Astro-Anthromathematics	December 29, 2015	<a href="http://www.ngds-ku.org/Presentations/Childhood-Obesity.pdf">http://www.ngds-ku.org/Presentations/Childhood-Obesity.pdf</a>
11	Astro-Anthrodynamics	May 1, 2016	<a href="http://www.ngds-ku.org/Papers/J44.pdf">http://www.ngds-ku.org/Papers/J44.pdf</a>



**PROF. DR. SYED ARIF KAMAL**

(<http://www.ngds-ku.org/kamal/Official.jpg>)

Homepage: <http://ngds-ku.org/kamal>

### MESSAGE OF DEAN, FACULTY OF SCIENCE

*Unity, Faith and Discipline, these are the three guiding principles given to us by the Father of Our Nation, Quaid-é-Azam, Muhammed Ali Jinnah (1876-1948), may Allah, Izz-o-Jal, be pleased with him. The journey, which started on August 14, 1947, completed sixty-eight years on August 14, 2015, when Our Nation celebrated her Sixty-Seventh Independence Day. On this historic occasion, Department of Mathematics, University of Karachi vowed to establish new records in quality of teaching, excellence of research and levels of community outreach. On the first day of 2016, I pray to Allah, SWT, that our graduating students would become paragons of knowledge, humility and piety (Ilm, Hulm and Taqwa) — life skills of Scholars of the Third Millennium — in this process transforming them into Leaders-Integrators\* of the Mathematics Community.*

Karachi, January 1, 2016

\*<http://www.ngds-ku.org/Papers/J39.pdf>

### DEPARTMENT OF MATHEMATICS

Name of the department has been changed back to Department of Mathematics (previously, Department of Mathematical Sciences) as per Resolution No. 4 of Academic Council held on May 20, 2015. The department was established in 1956. Prof. Dr. Suleman Kerawala was the Founder Chair-man. Prof. Dr. S. M. Yahya introduced course reforms. Below is a little overview of the department:

### PROGRAMS OFFERED

- |          |        |                               |
|----------|--------|-------------------------------|
| a) PhD   | d) MSc | g) BSc (Hons)                 |
| b) MPhil | e) MA  | h) Diploma in Mathematics     |
| c) MIBM  | f) BS  | i) Certificate in Mathematics |

**Program in Industrial and Business Mathematics** has been offered since 1995. **Program in Sports and Anthromathematics** has been recently approved by all statutory bodies. Last year **Program in Mathematics Teacher Education** has been approved by Board of Studies of Mathematics. In addition to these core programs, our department caters to the mathematics subsidiary (minor) courses in BS and BSc (Honors). Our department, also, renders services of its full-time faculty to teach mathematics courses in other programs and departments as well as government organizations.

### Aims and Objectives

- To inculcate habits of creative thinking, critical analysis (<http://www.ngds-ku.org/Papers/C24.pdf>) and rigorousness, so that he students start enjoying mathematics
- To make the student appreciate the uniqueness of mathematics as tool of the tools, having the power of generalization and the power of application
- To develop ability in students to formulate a problem using the language of mathematics
- To equip students with the tools required and the mathematical techniques applied in the industrial, the business, the financial and the health-care organizations
- To propose mathematical solutions to indigenous problems arising in the industrial, the business, the financial and the health-care sectors
- To strengthen academia-professional-world bonding by tailoring the courses and the trainings offered according to needs of the end-user

### Description of Programs

In the modern era of knowledge-based economy, it is absolutely necessary for a nation to uplift its standards of teaching, research and practice in science, technology and engineering. Mathematics is one of

the critical pillars, upon which the entire structure of scientific knowledge is established. Hence, a strong foundation for our graduates in mathematics is a pre-requisite for efficient progress in other quantitative and highly technical fields.

The undergraduate program has a blend of courses of both pure and applied nature. In the pure mathematics part of studies the students acquire knowledge in theories, which constitute the scientific foundation of development, systematization and justification of mathematical discipline in the investigation of real-life problems. This part is general enough to cope with future trends of mathematics.

The graduate program aims to expose students to latest research in mathematical sciences through a series of courses, seminars and involvement in on-going research activities. MPhil students write thesis based on original research based on problems formulated with the guidance of their research supervisors. They are expected to publish at least one research paper from their MPhil theses. Those, who show more independence and ability to think out-of-the-box [by conceiving a research problem, almost, independently and publishing a research paper on that work combined with excellent scores in MPhil courses and GRE/GAT (Subject) are eligible to apply for conversion to PhD]. One or more papers published with a demonstrated capability to, not only, work independently, but also, achieve excellence in mathematics, may bring them a PhD upon successful writing and defense of a dissertation. All MPhil theses and PhD dissertations are put through rigorous scrutiny by internal and external examiners. These documents, are, also, checked by anti-plagiarism software available at the disposal of University of Karachi and HEC (Higher Education Commission).

MPhil and PhD Programs of Department of Mathematics now comply with all requirements of HEC as per Resolution No. 4 of Academic Council dated May 20, 2015.

## FACULTY

Highly qualified faculty, with degrees from reputed universities in Canada, UK and USA, teaches courses according to the modern trends, based on problem solving, applications and hands-on training. Many of them are on the list of HEC-Approved-PhD Supervisors.

Our faculty is, actively, involved in teaching, counseling, research, administration, professional development and policy-making. These torchbearers of learning, regularly, produce research papers and act as referees of research journals of international repute, for example, *Clinical Biomechanics (Elsavir)*, *Optics and Laser Technology (Elsavir)* and *Proceedings of the Pakistan Academy of Sciences*. Some have, also, received research-productivity allowance from Pakistan Science Foundation. In addition, our researchers presented papers in *the World Climatic Change Conference, Moscow* (October 2003), *the World Conferences on Mathematics* (March 2004, 2005 and 2006) and *the National Australian Convention of Amateur Astronomers, Hobart, Australia* (April 2004), *the Fourth International Bhurban Conference on Applied Sciences and Technologies* (June 2005), *the Tenth National Aeronautical Conference* (April 2006), *the First National Conference on Headache and Back Pain* (October 2008), *the 35<sup>th</sup> All Pakistan Science Conference* (December 2008) and *the Thirty-Fourth International Nathiagali Summer College on Physics and Contemporary Needs* (July 2009). Faculty delivered invited papers in *the IEEE International Symposium on Biometrics and Security Technologies* (April 2008), *the International Conference on Physics and the World of Today* (December 2008, December 2009 and December 2011), *the IEEE INMIC 2008* (December 2008) and *the Fourth and the Seventh Symposia on Computational Complexities, Innovations and Solutions* (May 2009, May 2012). Professors from this department, also, chaired sessions in international conferences and were panelists in panel discussions. A senior professor of the department delivered keynote lectures in *the Sindh Educational Conference* (January 2009) and *the First and the Second Karachi University Educational Conferences* (December 2013, September 2015), ‘Prof. Dr. Muhammed Rafi and Prof. Dr. Muhammed Razi Hussain Memorial Lecture’ during *the National Conference on Physics and the World of Today* (December 2009), ‘Prof. Dr. Khursheed Alam Khan Memorial Lecture’ during *the Conference on General Relativity and Gravitation* (February 2010), ‘Prof. Dr. Q. K. Ghori Memorial Lecture’ during *the Fifth Symposium on Computational Complexities, Innovations and Solutions* (May 2010), ‘the Salim Ahmed Memorial Lecture’ during *the Pakistan Institute of Physics Conference* (March 2011), ‘the Islamuddin Memorial lecture’ during *the Sixth Symposium on Computational Complexities, Innovations and Solutions* (May 2011) and ‘Dr. Muhammed Ishaq Mirza Memorial Lecture’ during *the Third National Conference on Space Science and Technology* (October 2015). On March 22, 2010, the department organized *the First National Conference on Mathematical Sciences*, as part of the Golden Jubilee Celebrations. The program included popular lectures and papers



**Farewell party given to the outgoing BS (Fourth Year)**  
*Third from right, Dean, Faculty of Science (in blue suit);  
 on his right Convener, Students' Advisory Committee*

representing latest trends in mathematics as well as mathematical-environment session (recall of memories and mathematical-art competition). To honor our deceased member of Board of Studies, 'the Syed Firdous Memorial Lecture' was delivered by Prof. Dr. Syed Arif Kamal. A new branch of mathematics was introduced in this lecture, named as **anthromathematics**. *The Second Conference on Mathematical Sciences* was held on March 20, 2014 (<http://www.ngds-ku.org/CMS/2014/CMS2014.pdf>). On October 8, 2012, another branch of mathematics **astromathematics** was introduced in invited lecture delivered during Plenary Session of *the First National Conference on Space Sciences*. Table 1 gives a complete list of all new branches of mathematics introduced. Department of Mathematics, in collaboration of Government College, Hyderabad, Pakistan, organized *the First Conference on Anthromathematics in the Memory of (Late) Syed Firdous* on September 4 and 5, 2013:

<http://www.ngds-ku.org/Anthromathematics/2013/Anthromathematics2013.pdf>

and *the Second Conference on Anthromathematics and Sport Mathematics in the Memory of (Late) Hussain Ahmed Bilgirami* on September 4, 2015:

<http://www.ngds-ku.org/Anthromathematics/2014/Anthromathematics2014.pdf>

The First Lady of the United States (of America), Her Excellency, **Michelle Obama**, declared childhood obesity an epidemic from her country. However, a child is gaining height as the same time trying to maintain optimal weight through a combination of diet, exercise and lifestyle adjustment. If the child is advised to lose weight based on the current obesity profile, the youngster may become underweight (wasted). The honor came to Department of Mathematics, University of Karachi to present the first-, the second- and the third-generation solutions of childhood obesity in 2013, 2014 and 2015, respectively. Anthromathematics Group got ahead of the entire world in anthropometric techniques (height measured to least count of 0.01 *centimeter* and mass to 0.01 *kilogram*), in the height and mass charts and tables (containing entries of 0.01<sup>th</sup>, 0.1<sup>th</sup>, 1<sup>st</sup>, 3<sup>rd</sup> to 97<sup>th</sup>, 99<sup>th</sup>, 99.9<sup>th</sup>, 99.99<sup>th</sup> percentiles) and child growth-and-obesity modeling (generating 6 month-wise recommendations to attain specific values of height, in *centimeters* as well as feet and inches, and mass, in *kilograms* and well *pounds* and *ounces*, on date of check up for each successive month):

<http://www.ngds-ku.org/Presentations/Roadmap.pdf> (the first-generation solution)

<http://www.ngds-ku.org/Presentations/Enhanced.pdf> (the second-generation solution)

<http://www.ngds-ku.org/Papers/J38.pdf> (the third-generation solution)

<http://www.ngds-ku.org/Presentations/Vector.pdf> (the fourth-generation solution)

<http://www.ngds-ku.org/Papers/Vector.pdf> (the second-generation solution)

<http://www.ngds-ku.org/Papers/J45.pdf> (the fifth-generation solution — expected: January 1, 2017)

<http://www.ngds-ku.org/Papers/J45.pdf> (the sixth-generation solution — expected: October 1, 2017)



**On the occasion of dinner hosted by promoted faculty members of the department**

*From left to right, (front row) Prof. Dr. Syed Anwar Ali Zaidi (Chairman),  
Syed Shafaat Ali, Prof. Dr. Syed Arif Kamal (Dean, Faculty of Science),  
Shuja Muhammed Qureshi, Wasim Ahmed Ansari and  
Dr. Saqib-ur-Rahman;(second row) Muhammed Imtiaz,  
Dr. Junaid, Tanveer Ahmed Siddiqui and  
Dr. Najeeb Alam Khan*

Faculty members of this department are, currently, serving as Project Director of the NGDS Pilot Project (<http://ngds-ku.org>). Some of our faculty members held the posts of Pro-Vice Chancellor, Controller of Examinations, Convener, National Curriculum Revision Committee for Mathematics, Higher Education Commission (<http://www.hec.gov.pk>), Convener, Subject Committee for Mathematics, National Testing Service (<http://www.nts.org.pk>) and Convener, Subcommittee (Academics), the Education Committee, Transparency International Pakistan. Other distinctions of our faculty members include being the Founding Director of the Institute of Space and Planetary Astrophysics and current Dean, Faculty of Science. Our department was, also, represented in University of Karachi Syndicate as well as Board of Advanced Studies and Research (BASR). The department was represented in Committee to Investigate Plagiarism, Testing-Services Committee, PhD-Courses Committee and Committee to Evaluate Research Proposals as well as Expert Panel on Curriculum of Mathematics, National Curriculum Council, Ministry of Education, Government of Pakistan.

### STUDENT HONORS

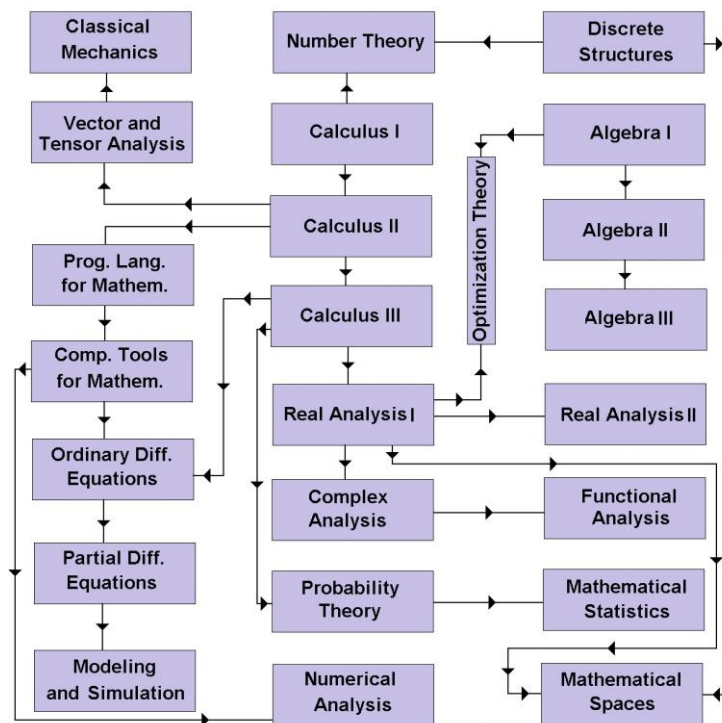
Many students of our department have topped the list of candidates in the entire university. In fact, our department has a number of positions in the Dean's merit list every year. Presidential Award "Izaz-é-Sabqat" was awarded to many of our students.

### RESEARCH

A Nobel laureate was asked, "What is the key to your success?" He replied, "I know what I am doing, in depth, and know a little bit about other disciplines". This strategy of complete knowledge of the problem at hand and knowledge of the associated fields is being applied to bring out efficient, elegant and innovative solutions to problems challenging the mankind in the third millennium, using the techniques of mathematics. Modeling of system, environment and sources of error is done using mathematical tools, fine-tuning to be done through simulations and test runs, followed by validation through field trials. Faculty is engaged in research in the following areas:

- 3-D Optical Imaging and Image Processing
- Algebra
- Anthromathetics and Biomathematics
- Astromathematics and Astro dynamics
- Fluid Dynamics
- Operational Research
- Relativity and Gravitation
- Security Technologies
- Sport Mathematics
- Teaching of Mathematics

Our department was the first to have PhD courses (800 series) approved. These courses are being offered every year since 2009.



**Precedence and influence graphs representing pre-requisites and co-requisites for BS (Mathematics) courses**

### SEMINARS

The Research-Seminar Series exposes students to current trends in mathematics and handling industrial projects. The Students'-Seminar Series trains them in presentation skills, job-searching skills and interviewing skills. Starting this year, we have introduced First-Year Seminar, specifically tailored to the entering students, who have passed their HSC examination. The topics of MPhil/PhD-Seminar Series include research-proposal writing, publishing in peer-reviewed journals, *etc.* Goal setting and time management are some of the topics covered in the Professional-Skills-Seminar Series.

During August 2004, Six-Day-In-Service Mathematics Training Course for college teachers was arranged by our department in collaboration with HEC Regional Center, Karachi. On September 30, 2010, there was a motivational lecture by eminent scientist of Pakistan, Prof. Dr. Muhammed Iqbal Chaudhry, Director, HEJ Research Institute of Chemistry on the state of science education and research in the Muslim world.

### INTERNATIONAL LINKAGE

Professors from Norwegian University of Science and Technology and King Abdul Aziz University (Saudi Arabia) as well as US scientists gave seminars in the department. The department is trying to establish liaisons with western universities. On October 28, 2008 a team from French Embassy in Islamabad visited our department and discussed possible projects for collaboration. Previously, Swedish team visited our department. Russian Consul General has, also, expressed interest in some of our programs.

### PROFESSIONAL EXPOSURE

Department of Mathematics established liaisons with multinationals and government organizations, *e. g.*, Engro Asahi Chemicals and Polymers (Ltd.), the Aga Khan Foundation, Pakistan Space and Upper Atmosphere Research Commission (SUPARCO), Data Communications and Controls, *etc.* The multinationals offer specialized trainings, internships and, eventually, jobs to our graduating students.



**COMMUNITY OUTREACH**

As part of its Community-Outreach Program, our department has been offering the Early Talent Research Participation Program (ETRPP) and internships to pre-university students since 2002. Departmental faculty, also, gave lectures to students enrolled in Talent-Farming Scheme of HEC. Mathematics-Teacher-Training Programs are to be conducted in collaboration with Faculty of Education, University of Karachi. Such programs have, already been conducted for teachers of the International School, Clifton and Beacon Light Academy, Gulshan-é-Iqbal, Karachi.

**USEFUL INFORMATION**

*Senior-Most Professor of University,  
Head, Anthromathematics Group and  
Dean, Faculty of Science and Engineering*

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<http://ngds-ku.org>

*Program in Sport and Anthromathematics*  
<http://ngds-ku.org/Papers/J39.pdf>  
<http://ngds-ku.org/Papers/J44.pdf>

*Mathematics Resources*  
National-Curriculum-Revision Committee for Mathematics, Higher Education Commission:  
Curricula for BS, MS and PhD in Mathematics  
<http://www.ngds-ku.org/HEC/ncrc.htm>  
Subject Committee for Mathematics, National Testing Service Pakistan:  
Curriculum for GAT (Subject: Mathematics)  
[http://www.ngds-ku.org/NTS/NTS\\_Math\\_Curriculum.pdf](http://www.ngds-ku.org/NTS/NTS_Math_Curriculum.pdf)  
Mathematics-Teacher-Interview Format  
[http://www.ngds-ku.org/Papers/J39/Additional\\_File.pdf](http://www.ngds-ku.org/Papers/J39/Additional_File.pdf)

*Chairman* **PROF. DR. SYED ANWAR ALI ZAIDI**  
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(includes link to map)\*  
<http://www.ngds-ku.org/kamal/contact.htm#Directions>

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\*Copy and paste the link, which follows, into the browser window

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*Web address of this document:* <http://ngds-ku.org/math/math.pdf>