REPORT ON SCIENTIFIC AND SCIENTIFIC –ORGANIZATIONAL ACTIVITY OF THE INSTITUTE OF MATHEMATICS AND MECHANICS FOR 2014



## I. GENERAL INFORMATION AND OBTAINED IMPORTANT RESULTS ON EXECUTION OF SCIENTIFIC – RESEARCH PLANS

In 2014, at the Institute of Mathematics and Mechanics, the works were executed in two directions: mathematics and mechanics.

The researches in these directions include 8 problems. 5 of these problems refer to mathematics, 2 to mechanics, 1 to history of science and technology. The works executed in the field of mathematics are the followings:

- **Spectral theory of operators and theory of operator algebras.**

Studying weighted composition operators in functional spaces and regular algebras; invariant subspaces of the operator in operator algebra; the properties of a class of operators in Banach space. Construction of a mathematical model of some random processes; investigation of direct and inverse problems of spectral theory.

(head of the problem: prof. Hamidulla Aslanov )

**-Theory of function spaces and problems of harmonic analysis in manifolds.**

Approximation of functions of a many group of variables; $n-q$ typicalness of shift operators generated by the Bessel operator in weighted spaces. Studying the boundedness of potential type integral operators in different spaces.

(head of the problem: acad. Akif Qadjiyev, corr.-members of NASA: Bilal Bilalov, Vagif Quliyev, doct. ph.m.s. Vuqar Ismayilov)

**-General and quality theory of differential and differential operator equations.**

Solving boundary value problems for differential and differential-operator equations, studying quality properties of the solutions; investigation of spectral properties of boundary value problems; optimal control problems in descrete systems.

(head of the problems: corr-member of NASA Rauf Huseynov, prof.Misir Mardanov, Akper Aliyev)

**-Problems of algebra and logic**.

Methods of algebra logic in discrete mathematics and theoretical physics.

(head of problem: doct.ph.m.s. Yuriy Turovsky, cand.ph-m.s.,docent Ali Babayev)

**-Calculation information technologics of the solution of interdisciplinary mathematical problems.**

Analysis of boundary value problems for viscous uncompressible fluid in closed domain by using the methods of differential equations, modeling, calculus mathematics and preparation of mathematical program packet.

Elaboration of a numerical method and algorithms for optimal control of parametric systems;studying of working out of the Azerbaijanian language in computers and creating a complex software.

(head of problem: docent Fariz Imranov)

The research works on mechanics include 2 problems:

**-Mechanics of deformable solids.**

Construction of determining functions of bodies having various physical-mechanical properties; elaboration of solution methods of statistical and dynamical problems for the bodies under investigation; preparation of a mathematical method determining the place of fracture, some and the number of structural elements due to initial and iterative loadings; determination of stress strain state and fracture time under the action of extremal effects (forces, temperature, radiation, corrosion in constructions , investigation of stability and oscillations.

(head of problem: prof. Jafar Agalarov, Vagif Qadjiyev, Qabil Aliyev, Latif Talybly).

-Experimental and theoretical investigations of non-stationarity and unstability generated in heteregeneous systems , gassy fluid, dispressive solution, composite mixture, flow and filtrations; is found the solutions for different technological processes by suggesting conditions and offers providing regularization in desored directions.

(head of problem: corr.member of NASA Qeylani Panahov)

**History of science and engineering**.

Studying mathematical heritage of Azerbaijan scientists Nasreddin Tousi ( head of department docent Ali Babayev)

On these problems, the scientific research works were carried out 16 themes, 125 works. 123 of these works were completed. The first stage in the second work was completed, the second stage will be completed in 2015. 84 0f 125 works belong to mathematics, 41 to machanics.

| year | problem | theme | work | stage | completed | | Important results |
|---|---|---|---|---|---|---|---|
| 2013 | 8 | 15 | 124 | | work | stage | 16 |
| 2014 | 8 | 16 | 125 | 2 | 124 | - | 14 |
| | | | | | 125 | 2 | |

On the report year the investigations of the institute scientists were carried out according to a priority directions of the investigations of NAS of Azerbaijan and confirmed by the Presidium of NAS of Azerbaijan.

On each mentioned directions the Institute scientists have obtained highly evaluated scientific results. These results were discussed at different international and republican Conferences, symposiums, seminars,were published in the journals and were highly estimated by the specialists.

On November 2014, at the scientific Council of the institute the report of research associates on each work was heard and after discussions in scientific works were introduced as important results.

**1.1 Mathematical science**

**1.1.1 Spectral theory of operator algebras.**

The inverse scattering problem for Sturm-Liouvill operator with a spectral parameter in discontinuity condition as a semi-axis was solved and its application to the solution of the inverse problem with respect to two spectra on a finite interval was given. (executor: prof. Hidayat Huseynov)

**1.1.2 Theory of function spaces and problems of harmonic analysis in manifolds.**

The differential properties of the symbol of many-dimensional Calderon-Zigmund singular operator in weighted Bessov potentials spaces were studied and on the weighted same space the theorems on oscillating properties of Fourier series with respect to spheric harmonics were proved.

ex. acad. Akif Gadjiev.

Necessary and sufficient conditions for interpolation by the set of sums of Ridge functions in two directions on two lines were found.

It was proved that the interpolation with this set on three or more lines is not impossible.

ex:. d.ph.-m.s. Vugar Ismayilov

The structural properties of variable order Lebesgue spaces were investigated and some boundedness theorems of Hardy operator on variable degree weighted Lebesgue space was proved.

ex. : docent Rovshan Bandaliyev

The boundedness of a certain class of sublinear operators generated by a singular integral operator, and of their commutators in generalized Orliiz-Morry spaces was proves.

ex.: corr-member of NASA, prof. Vagif Guliyev, doc.ph.-m.s. I.Hasanov

The motion of m-statistic expansion and m-statistic fundamental property in dimensionless space at a point was introduces and their equivalence was proved.

ex.: corr-member of NASA , prof. Bilal Bilalov

The motion of t-frame generated by the of Hilbert tensor was introduced, all the properties of all simple frames were taken to the case of t-frame.

ex.: corr-member of NASA, prof. Bilal Bilalov, docent Sabina Sadiqova, docent Fatima Guliyeva

**1.1.3. General and quality theory of differential operator equation.**

Theorems on spectrum and trace of boundary value problem with a spectral parameter in boundary conditions were proved.

Executor: prof. Mammad Bayramoglu, d.m.s. Nigar Aslanova.

The Fredholm property of an operator condition boundary value problem for elliptic type differential equations of fourth order was proved/

Executor: d.m.s. Bahram Aliyev.

The increment theorems for positive solutions of second order parabolic equations in important domains were obtained and their various applications were shown.

Executor: doc. Abdurrahim Guliyev.

The existence of global solution of a periodic coefficient semilinear parabolic equation with respect to time argument in extermal domain of the ball was studied and evolutions for the existence of positive global solution in the case of nonlinearity were performed.

Executor: cand. ph.m.s. Shirmayil Bagirov.

**1.2. Mechanics.**

**1.2.1. Mechanics of deformable solid.**

The theory of qualitatively efficient fracture of structural elements made of visco-elastic material at non-monotone loadings was given.

Executor: prof. Latif Talybly.

The general solution method of nonstationary wave propafation in laminary cylindrical domains was given.

Executor: d.ph.m.s. Nazila Rassoulova.

the load carrying capacity of cylindrical shells, annular and circular plates subjected to different kind of loads was studied, corresponding values of loading coefficients was found.

Executor: prof. Musa Ilyasov.

## II. THE APPLIED SCIENTIFIC RESULTS.

| Year | The member of works by plan | Including | | Was executed according to plan | Was not executed | Was applied in addition to plan |
|---|---|---|---|---|---|---|
| | | past | new | | | |
| 2013 | 1 | - | - | 1 | - | 1 |
| 2014 | 1 | 1 | - | - | - | - |

In 2014 the plan of scientific-research works of IMM NASA included both the fundamental and applied character scientific engineering works.

The plan of completed works of the institute for 2014 indents to apply one work. "Development of new technological methods for prevention of asphalted resin was sediments in oil production". The laboratory tests on this theme are being continued.

In laboratory tests, the thermometric heaters whit $1000 \pm 2000\,Vt$ force and $230V$ of diameter $10mm$ and length $800-1000\,mm$ and located on a special pipe of diameter $43mm$ was used.

Depending on different heating time of thermometric heaters the temperature differences were observed. We heating thermo electrical heaters were heated during 1,5; 2,0 and 4,0 minutes, the surface of temperature change on the surface of steel pipe was derived.

Bused on experimental results, the thermo electrical equipment was tested of the well № 405 of N. Narimanov oil gas production administration according tv program and methods of tests taking into account the results of the test works, the commission created by "Azneft" production union conformed high technological potential of the electric heater and suffested to use this equipment in the object of "Azneft" production union once week.

In addition the method characterizing the corrosive failure of metals in aggressive of the institute Raisa Kazimova in ready for application.

## III Characteristics of scientific research programs.

In the resolution №12/5 dated from 11.06.2014of the Presidium of NASA "On priority directions of scientific research works to be held in the Republic of Azerbaijan" the following priority direction of scientific research works to be held of IMM were confirmed,

1. Differential equations and spectral theory of operations.
2. Harmonic and non- harmonic analytic.
3. Theoretical and applied problems of reformat bodices fluid gas mechanics.

Scientific-research programs on the following to themes on actual and technological problems in the indicated priority directions were prepared and submitted to scientific- organizational administration.

1. Some problems of non harmonic analyzing and spectral theories of operators, and their applications .

Head : coor. member of NASA Bilal Bilalov.

2. Optic monitoring of anthropogenic air layer in Apsheron peninsula.

Head: doc. Telman Gasymov.

3. Spectral analytic of some third order operator pencils and some related initial boundary value problems.

Head : prof. Araz Aliyev.

4. Contemporary problems of harmonic analysis in some new functions spaces and their applications.

Head : coor. member of NASA Vagif Guliyev.

5. On heat exchange models on the boundary of water –bottom sediment of the Caspian Sea.

Head: prof. Akper Aliyev.

(together with the Institute of Geology and Geophysics).

6. Creation of hydromechanics theory in nanotype systems.

Head: prof. Gabil Aliyev.

7. Mathematical theory of fatigue process of constructions exploited in aggressive medium.

Head : prof. Latif Talybly

8. Intradisciplinary fundamental problem of Earth sciences mathematical and mathematical solution methods and innovation methods in approving the results.

(in collaboration with IMM, Institute of Geology and Geophysics, Istanbul Yildiz Engineering Institute, the Republican Seismological service center, Baku state University).

9. Stability of structural elements made of cured condition

Head: Tamilla Zeynalova

10. Investigation of three-dimensional elastodynamics problem.

Head: d.ph.m.s. Nazila Rassulova.

2. International scientific relations.

The international relations were realized by conferences, symposiums, seminars, scientific arguments.

The corr. member of NASA, prof. V.S. Guliyev at the mathematics deportment of Ankara University (Ankara Turkey) has carried out scientific investigation on the theme "Roundedness of fractional Hardy operator in Morrey-type spaces " together with the professor of this University Ayhan Sherbetchi, the professor of Kardiff and Avrasia Universities Viktor Burenkov and the associate professor of Cardiff University Dr. Tamara Tararykova.

The corr. member of NASA, prof. V.S. Guliyev at Kirsheher (Turkey), of Ahi Evran University on March 2014, together with prof. Yoshishiro Sawano (Tokio Metropolyten University Japan) and held "Workshop on Function spaces and Applications" carried out joint scientific researches an the theme "Generalized Hardy-Morrey spaces".

The on april 14-24, member of NASA prof. V.S. Guliyev together with professor Stefan Samko (Alvarge University Portugal) held "Workshop on Function spaces and Applications" at Kutahya (Turkey), Dumlupinar University and carried out joint scientific researches on "maximal potential and singular operators in the generalized Orlicz-Morrey spaces " and the paper "Functional maximal and potential operators and their Commutators in vanishing Orlicz- Morrey spaces" by F. Demingoz, V.S. Guliyev, Stefan Samko was prepared and published in Revista Mathematica Complutense journal.

Corr. member of NASA prof. V.S. Guliyev has carried out scientific investigations with professor of department of Civil Engineering, Second University of Naples (Aversa, Italy) at Krishesher city of Turkey at Ahi – Evran University.

Doctor of math. Sci. Yuri Trovskiy was on professional trip by the invitation of Pekin Engineering Institute and together with Chinese mathematicians discussed the results obtained on spectral theory of Jordan Banach algebras.

Corr. member of NASA prof. Geylani Panahov and associate professor Eldar Abbasov have been in Pekin and Chansha cities of China People Republic and made discussions according to agreements between IMM and GCC Group Corporation Innovation company.

Doctor phys. m. s. Farman Mammadov carried out investigation at Salerno University of Italy on "Excepetionability and approximation problem for elliptic type equations invariable order spaces ".

Corr. member of NASA prof. Bilal Bilalov made joint scientific researches on "Some problems of approximation and frame theory " together with Engineering University (Danemark).

Docent Vafa Mammadova made scientific discussions at Florida Technical University (the USA) on the grand project "Some exceptionable singularities for partial parabolic and elliptic type equations" .

On 2014, the fallowing singularities have taken part at the seminars beyond the Republic Krakov and Zakapane cities Poland.

Corr. member of NASA prof. Geylani Panahov, prof. Soltan Aliyev, cand. t.s. Eldar Abbasov.

Tibilisi city, Georgia. Coor. Member of NASA Bilal Bilalov doct. P.h.m.s., prof. Akper Aliyev, doc. P.h.m.s., Farman Mammadov , cand. P.h.m.s., docent Rovshan Bandaliyev, cand. P.h.m.s., Ali Huseyinli, j.r.a Aida Guliyeva Brono city, Chekhia. Prof. Soltan Aliyev Novorssiysk city, Russia, docent Rovshan Bandaliyev Moscov city, Russia. Carr member of NASA Geylani Panahov, associate prof. Eldar Abbasov Sanct Peterburg city. Docent Ali Babayev.
Issikkul city, Kirkizistan. Prof. Misir Mardanov Samarkand city, Uzbekistan, docent Ali Babayev Solerno city, Italy. Doct. Ph.m.s. Farman Mammadov.

On 2014, the institute has continued its scientific interrelations with leading science centers of foreign countries.

1. “ Investigation of oil and gas hydrodynamics problems, research and elaboration of new oil production technologies”. Russian Academy of Natural Sciences; The Institute of system investigations of oil and gas production (Moscow);
2. “Development of oil resources production technologies by interlayer gas formation”. New Mexico Institute of Mining and Technology (USA);
3. “Investigation of oil field mechanics problems; Investigation and development of new oil production technologies” GCC Group Inc. (Peking);
4. Spectral properties of differential operators. Approximation theory. Kiev National University (Kiev);
5. “Investigation of different classes of random processes” Ivan Franco Lvov National University (Lvov);
6. Mixed type problems and relative problems of analysis and informatics. Applied mathematics and Automatization research institute, Kabardino-Balkaria science center of RAS (Nalchik);
7. “Theory of function spaces and problems of harmonic analyses”. V. A. Steklov Institute of Mathematics of RAS (Moscow);
8. “Mechanics of machines and materials”. Byelorussia NAS. United Institute of Machine building (Minsk);
9. “Mechanics of methods, algorithms and software for solving optimality problems by the application of multiprocessor computation technology”. RAS, A. A. Dorodnitsin Computation Center of M. V. Lomonosov MSU (Moscow);
10. “Solving viscous fluid problems by numerical methods”. RAS, A. A. Dorodnitsin Computation Center of M. V. Lomonosov MSU (Moscow);
11. “Some problems of approximation and frame theory”. Denmark Technical University (Denmark);
12. “Exception ability and approximation problems for elliptic type equations in variable order spaces”. (Italy);
13. “Spectral analysis of the Hill operator in star shape graphs”. Valencia Polytechnic University (Spain)

On the report year the former research associates of the Institute : Ilham Aliyev, Anar Dosuyev, Fakhraddin Abdullayev, Surkhay Akperov , Varga Kalantarov, Heybatgulu Mustafayev, Daniyal Israfilov, Etibar Panahov, Mubariz Garayev, Rauf Amirov, Kamal Soltanov, Azer Khanmamedov, Khanlar Mammadov, Azer Kerimov, Mansur Ismayilov and others have continued their activity at leading scientific and education institutions of Turkey.

The mentioned persons keep close relations wife, the institute, give a talk at the Institute seminars , participate in personnel training at the Institute and publish scientific papers in scientific journals.

The collaborator of the Institute have been the members of the editorial board or referees of some authorative scientific journals.

Academic Akif Gadjiev the member of the editorial board journal "Mekhanika mashins, mekhanikzms i materialov" (Byelorussian); the reviewer of " Journal of Mathematical Inequalities (Croatia) , "Integral transforms and Special Functions" (England), "Positivity" (Germany), "Turkish Mathematical Journal" and "Journal of Applied Mathematics" (USA).

The corr. Member of NASA Vagif Guliyev is the reviewer of "Journal of Mathematical Inequalities (Croatia) "Integral Transforms and Special Functions" (England), "The Scientific World Journal" (USA), Journal Functions spaces" and Mathematics Nachrichten" (Germany), "Complex variables and Elliptic Equations" (Italy) "Journal of Mathematical Analysis and Application" (USA).

Professor Asaf Zamanov is the member of the editorial board of the journal "Mekhanika kompositnikh materialov" (Latvia).

Professor Vagif Gadjiev is the member of the editorial board of "international Journal of Applied Geoinformatics" (Canada).

Corr. member of NASA Bilal Bilalov is the reviewer of the journals "American Mathematical Society", Applied Mathematics Letters (Elsevier), "Proceedings of the Estonian Academy of Sciences" and "Journal of Applied Mathematics and Competing" (Springer)

Professor Latif Talybly is the reviewer of the journals "International Journal of Fatigue (Elsevier) and "Simulation Modeling Practice and Theory (Canada).

Professor Mammad Bayramoglu is the member of the editorial board of the journal "Balkan Journal of Mathematics".

Professor Akper Aliyev is the reviewer of the journals "electronic Journal of Differential Equations" (USA),

Turkish Mathematical Journal, Vietnam Mathematical Journal", "Count Mathematics".

Doctor of Mathematic science Araz Aliyev in the reviewer of the journals" Pure and Applied Mathematics", "Mathematics and Statistics".

Professor Tahir Gadjiyev is the reviewer of the Journals "British Journal of Mathematics" , " Mathematics and Statistics".

Professor Tahir Gadjiyev in the reviewer of the journals "Brisih Journal of Mathematics", "Journal of Advanced Mathematics", "Applied mathematics" (USA).

Associate professor Rovshan Bandaliyev in the reviewer of Journal "Journal of Mathematics Research" (Canada).

Associate Professor Javanshir Hasanov is the reviewer of the Journals. "Turkish Mathematical Journal", "The Scientific World Journal", "Journal of Inequalities and Application", "Pioneer Scientific Publisher" "Journal of Function Spaces" "Journal of Mathematical Inequalities" (USA).

Doctor of mathematics science Farman Mammadov is the reviewer of the journals "Journal of Function Spaces" (USA), "Boundary Value Problems", "Journal of Inequalities and Applications" (Germany), "Complex variable and elliptic equation" (Italy), "British Journal of Mathemtics", "international Journal of Applied Mathematics" (USA).

## 3. Grants

On the report year the research associates of the Institute as an additional means have used the aids of different foundations and programs.

The scientists of the Institute have been the winners of two projects of the science foundation of SOCAR for 2014.

1. Processing of elaboration maps and Computer informatics-program system for optimal location of new operation wells. (60000 man. ) 10.10.2014-10.042016. Head: prof. Tahir Gadjiev.
2. Complex investigation of optimal control problem of intralayer combustion process in oil production. (45000 man.) 10.10.2014-10.10.2015. Head: p.h.d. In math Rafig Teymurov.

The winners of 3 (three) grand projects of 2013 held by the Science Development Foundation at the President of the Republic of Azerbaijan .

1. On same new exceptionable singularity problems for practice parabolic and elliptic type equations. (9000 man.) 01.05.2014-01.05.2015. Head: docent Vafa Mammadova.
2. The bases consisting of Faber polynomials in weighted Smirnov classes. (5000 man.) 01.05.2014-0.05.2015. Head : docent Sabina Sadigova.
3. Mathematical Simulation and software of regional ecological monitoring central system. (60000 man.) Head: Docent Telman Gasymov.

The winners of three grand projects of the competition of the Science Development Foundation at the President of the Republic of Azerbaijan for 2014.

1. Boundedness and application of integral operators of real analysis in some function spaces. (55000 man.) Head: Corr. Member of NASA Vagif Guliyev.
2. Representation of the many-variable functions by the sums of Ridge Functions. 8000 man. Head: Doct. Math. Vugar Ismayilov.
3. Inverse problems for a week system of stationary and no stationary parabolic equations. 45000 man. Head: Adalat Akhundov.

The Collaborator of the institute have continued their works on 8 grant works that they have won in 2013.

6 grants of the Science Foundation of SOCAR

1. Scientific bases for development of new methods for increasing oil production in deep hydrocarbon pools possessing complicated geological-physical properties. 90000 man. 15.10.2013-15.10.2015. Head: acad. Akif Gadjiev.

2. Mathematical statistics methods and software for operative determination of operating mode of wells. 90000 man. 15.10.2013-15.10.2015. Head: prof Gabil Aliyev.

3. The role of double hidden layer neural networks in optimization of oil production. 12000 man. 15.10.2013-15.10.2015. Head: Vugar Ismayilov.

4. Investigation of strength characteristics of structural elements used in production and transportation of oil and gas choice of optimal variant of the construction. 80000 man. 15.10.2013-15.10.2015. Head: prof. Vagif Gadjiev.

5. Dynamics of propagation of hydrocarbon pollutions on water. 45000 man. 01.10.2012-30.09.2014. Head: prof. Akper Aliyev.

6. Determination of stagnant oil fields, algorithms and software for optimal location of operational and injection wells. 160000 man. 01.10.2013-31.03.2014 Head: prof. Soltan Aliyev.

Two grants of Turkey Ahi Evran University:

1. Boundedness of fractional integral operators in generalized Orlicz-Morrey spaces. 2000 man. 02.10.2013-02.10.2014. Head: corr. member of NASA Vagif Guliyev.

2. Boundedness of Orlics-Morrey spaces of integral operators of harmonic analysis. 4500 man. 16.06.2013-16.06.2015. Head: corr. member of NASA Vagif Guliyev.

In the competition held on the occasion of 20 years of the great oil agreement "Agreement of the Century", docent Famil Seyfullayev has gained the 3-rd place on the project" Stability and oscillations in cylindrical constructions contacting with a medium strengthened with ribs".

The young scientists of the institute cand. Ph.m.s docent Togrul Muradov, ph. doctor in math. Sabina Sadigova were the Winners of the competition held on occasion of the Day Republic, 28 may.

| Year | General amount rants | Sum of the grant | The foundation organizations where grant has been ived. |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 2013 | 2 | 14.000 AZN | Science elopment ndation of the ident of Azerbaijan ublic. |
| | 4 | 272.000 AZN | Science Foundation of CAR. |
| 2014 | 3 | 108.000 AZN | Science elopment ndation of the ident of Azerbaijan ublic. |
| | 4 | 105.000 AZN | Science Foundation of CAR. |

3. Interrelation of fundamental science and education.

On the report year, alongside with scientific activity the research associates of the Institute have been engaged in pedagogical work.

1. Execution of Coordination works in “Zangi” and “Physics-mathematics and informatics” lyceums.

2. The research associates of the Institute have given lectures, conducted specialty courses and supervised dissertation works of holders of a master’s degree at Baku State University, National Aviation Academy, Azerbaijan State Economics University, Azerbaijan State Pedagogical University, Azerbaijan State Technical University, Azerbaijan Architecture and Construction University, Azerbaijan State oil Academy, Azerbaijan Cooperation Institute, The State Management Academy at the President of Azerbaijan Republic, Sumgait State University, Qafqaz University, Azerbaijan Teachers Institute.

3. The council of young scientists and specialists of IMM has hold the knowledge competition at school N6 named after S. Kazimbeyov in Lenkoran city devoted to may 28 – The Day Republic under the motto “Think logically”. In this competition the pupils of school N4,7,10 of Lenkoran city, Shuruk and Holmilli villages have received certificates and gifts.

4. A group of teachers from BSU, ASPU, AACU, has taken part in improvement of skill the students in scientific test.

5. On November 10-11 , 2014, at the Science Festival held by the initiation of NASA, the head of department professor Gabil Aliyev has given a talk “Creation of

theory of hydrodynamics in nano type systems", and the young scientists demonstrated the scene "Magic mumbers".

6. They have chaired the Higher Attestation Commission in Agjabedi, Salyan and Sheki branches of BSU, SSU, GSU and ATU and NASA.

7. Some collaborators of the Institute have worked as the members of the expert Commission of Higher Certificate Commission on Mathematics and Mechanics at the President of Azerbaijan Republic.

The Conferences, Seminars, Jubilees.

On 2014 IMM of NASA has held 2 (two) International and one (1) Republican Conferences.

1. By the resolution N 2/8 of the Presidium of NASA dated from 05 February 2014, the International Conference devoted to 55 years of IMM "Actual Conference devoted to 55 years of IMM "Actual problems of mathematics and Mechanics was held. (15-16 may, 2014)

Five scientists from foreign countries (Russian, Turkey, Iran) have participated at the conference, six (6) plenary lectures were heard and 205 abstracts were published.

2. The International Conference "History, present state and look for a future of mathematics, astronomy" devoted to memory of Nasiradden Tousi was held (September 10-12, 2014). 24 scientists from foreign countries (Russia, Iran, Turkey, Spain, France, Switzland, Great Britain, Uzbekistan, Georgia) have participated at this conference, 7 plenary lectures were heard and 41 papers were published.

Academician of the International Academy of History of Science Sergey Demidov, professor of Lozanna Polytechnical University Alimed Jabbar, president of Manchester branch of British Islam heritage Center Salim Ayduz had addressed the conference.

3. The scientific Conference "Spectral theory of differential operators" devoted to memory of academician Mirabbas Gasymov was held on December 8-10, 2014. 24 scientists from foreign countries (Russia, Israil, Iran, Italy, England, Great Britain, Spain) have participated at the conference, 6 plenary lectures were heard, 35 papers were published.

Professors of M.V.Lomonosov Moscow State University Andrey Shkalikov, Garakhan Mirzoyev, prof. of Bashkordstan State University Yakov Yakubov, professors of Turkey Universities Heybatgulu Mustafayev, Rauf Amirov, Manaf Manafov, Etibar Panahov, Khanlar Mammadov, Dona Karahan and other addressed the meeting.

The collaborators of the Institute have participated at the following events held in the Republic and abroad.

II International Caspian "Water Technologies" Conference (April 11, 2014, Baku)

The Republican Scientific Conference “Classical and contemporary problems of mechanics” devoted to 100 years the outstanding scientist of Azerbaijan, correspondent member of NASA, prof. Y.A. Amenzadeh (Baku, May 21, 2014)

The International Conference “Fourier series and their applications”. (May 27-June 3, 2014, Russia, Novorossiysk)

The International Conference “Mini-courses in Mathematical Analysis ” (June 10-14, 2014, Padova, Italy)

The International Conference “Congress of Turkic World Mathematicians” (June 5-7, 2014, Bulan-Sogottu, Kigizistan)

The International Conference “Modern materials of mathematics, mechanics and informatics” (September 15-19, 2014, Tula, Russia)

The International Scientific Conference “Geopetrol-2014” (September 15-23, 2014, Poland, Zakopane and Krakov cities

Caucasian Mathematics Conference CMC I (September 5-6, 2014, Tbilisi, Georgia)

Second International Conference “Ratio of discrete and continuous in the works of Nasireddin Tousi” (November 27-28, 2014, Sankt Petersburg, Russia)

International Conference on recent advances in pure and applied mathematics (ICRAPAM 14), (November 6-9, 2014, Antalya, Turkey)

X International Fracture Conference (Kayseri, Turkey, 2014)

22-nd International Conference on Mechanics of 2014. Composite materials (MCM-2014), Riga, Latvia

Historical heritage of scientists and thinkers of middleage East, its role and value for contemporary civilization (Samarkant, Uzbekistan)

Activity of Scientific Council

The Scientific Council coordinates the research works of the collaborators of the Institute on fundamental fields.

As in previous years, in this year as well, in by using the scientific potential of the Institute in solution of scientific strategical problems of the country, in connection with execution of the following state programs and plans , research and scientific-technical works were done and they were regularly discussed at the scientific Council.

In 2014, 16 meetings of the scientific council was held.

At the meetings of the scientific Council, the execution of appropriate resolutions of the President of Azerbaijan Republic and of the Presidium of NASA, the plan of scientific-research works of the Institute, plan of application of completed research works, personal problems, jubilees, decorations, publishing activity, conferences, professional trips, activity of departments, new successes of science and technology, joint scientific technical cooperation, renewal of electron site of the Institute, discussion and affirmation of research plans for 2014, electrons of corresponding members and the director, attestation of research associates, doctoral degree candidates and Ph D candidates reelection of the research associates to their posts, awarding the authors for the papers published in Thomson Reuters list journals and so on.

According to information of Science Publishing Group company, the paper of associate professor of IMM Risa Kazimova “Alternative procedure of deducing Robotnov’s relation for the time to corrosion fracture of metals” (Materials Science, Canada, 2010, vol. 40, №2, p. 265) was highly evaluated by many scientists of the world.

On the report year, the institute seminar, 8 regular seminars, and the city seminar on mathematical analysis under the guidance of acad. Akif Gadjiev were held.

The United seminar on mechanics has continued its work. In these seminars, the philosophy doctor and doctor of science dissertations, important results obtained by the research associates of IMM and other science centers were discussed.

On the report year the institute seminar has worked continuously, and aloufside with the collaborators of IMM the known scientists from foreign countries have also given talks.

The specialist of Volfran Research Institute (USA) on technical communications and development strategy Vitaliy Kaurov gave a talk “Application of Volfran Technologies in Research and education problems” professor of Ataturk University of Turkey, professor of subject faculty Arif Salimov on “Some remarks on Anti-Keler-Kodatsi structures”, the research associate of Humboldt University (Germany) Ilmar Balakhan oglu Gahramanov on “Elliptic hypergeometric functions” professor of Koch University of Turkey Varga Kalntarov on “Finite asymptotic behavior of dynamic systems generated by strongly damping wave equations” and professor of Tel-Eviv University of Israel Yakov Yakubov “Elliptic differential operator problems in Hilbert and Banach spaces”

7. Publishing activity

The published important results and successes

**Name of scientific institution**

<table>
<tr><td rowspan="10"></td><td rowspan="10"></td><td colspan="2">Genera number of books, monographs, papers, abstracts</td></tr>
<tr><td colspan="2">Books</td></tr>
<tr><td colspan="2">Monographs</td></tr>
<tr><td colspan="2">Papers</td></tr>
<tr><td colspan="2">Abstracts</td></tr>
<tr><td>Books</td><td rowspan="5">Including abroad in</td></tr>
<tr><td>Monographs</td></tr>
<tr><td>Papers</td></tr>
<tr><td>Abstracts</td></tr>
<tr><td>Papers published in impact factor journals</td></tr>
<tr><td></td><td></td><td>Text books and scientific popular publishings</td><td></td></tr>
<tr><td>850</td><td>672</td><td>References</td><td></td></tr>
</table>

On 2014, the institute collaborators have published 403 scientific works including 223 papers (110 in abroad) in impact factor journals 58 papers (35 of them in abroad), the citations to the papers of research associates are about 850. Each of the authors were awarded with cash bonus in the amount of 300 manat for their papers published in Thomson Reuters list journals.

These papers were published in the following journals: International Journal of Mathematics, Complex Analysis Operator theory, Complex variables and elliptic equations, Colloquium Mathematicum, Applied Mathematics and Computation, Journal of Approximation theory, Journal of Mathematical Analysis and Applications, International Journal of Damage Mechanics, Acta Polytechnica Hungarica, Journal of Machinery Manufacture and Realibility, Journal of Mathematical Inequalities, Positivity, Filomat, Czechoslovak Mathematical Journal, Boundary Value Problem, Georgian Mathematics, Computers materials & Continua, International Journal of Engineering Mechanics, Mechanics of Time Dependent Materials, Journal of Sound and Vibration, Ukrainskii Mathematicheskii Zhurnal, Vestnik RAEN, Mekhanika Kompozitnikh Materials, Mathematicheskiye Zametki.

On 2014 at IMM 7 scientific Journals were published:

1. Trans. Of NAS of Azerbaijan, No1, vol. XXXIV, 2014
2. Trans. Of NAS of Azerbaijan, No4, vol. XXXIV, 2014
3. Proc of IMM, No 1, vol. XXXX, 2014
4. Proc of IMM, No 2, vol. XXXX, 2014
5. Proc of IMM, vol. XXXX, Special issue, 2014
6. Azerbaijan Journal of Mathematics, vol. 4, No. 1, 2014
7. Azerbaijan Journal of Mathematics, vol. 4, No. 2, 2014

The journals are reviewed in abroad and have been included into the list of periodicals approved by the Higher Certificate Commission of the President of Azerbaijan Republic for publishing the main results of dissertation 6 journals from Azerbaijan are among the 29382 journals observed and estimated by SSR agency and published in about 200 countries of the world. 2 of them are on mathematics "Azerbaijan Journal of Mathematics", "Applied and Computational Mathematics".

The Institute scientists have published 4 monographs and 5 text books.

In abroad :

1. Rovshan Gumbataliyev "On solvability of boundary value problems for operator-differential equations and some spectral problems", "nauka", Moscow, 2014, 170 p.

2. ( bax səh. 24/azərb. Dil)
3.
4.
5. Ramiz Aslanov, Olga Lie, Togrul Muradov. Mathematical Analysis. Brief course. Textbook for the students of higher institutions. M. Prometei, 2014, 284 p.

In the Republic

1. Misir Mardanov, Sabir Mirzoev, Eminaga Mammadov. "Additional chapters of elementary mathematics and Olympiads". Book III, Baku, 2014, 317 p.
2. Rovshan Humbataliyev, Fatima Guliyeva, Hidayat Tagiyev. "Fundamentals of economical informatics". Coop. publ., Baku, 2014, 335 p.
3. Rovshan Humbataliyev, Fatima Guliyeva. "Theory of probability and mathematical statistics". Coop. publ., Baku, 2014, 441 p.
4. Asaf Zamanov. "Mathematics and Logic". Text book. Baku, 2014, Intern. Book Publ., Baku, 316 p.

## 8.LIBRARY

On the report year the order-information stock of the library of IMM has increased by some copies of literature.

This year the library acquired 643 scientific literature as a gift, including books and brochures – 278 (239 on russian, 35 in azerbaijanian, 4 in foreign languages).

The volume of the book stock – 20006 copies, including 1037 in foreign languages. Periodical – 216 copies, including 119 in Russian, 96 in foreign languages, 1 in azerbaijanian.

The stock of periodicals – 25639 copies including 13633 in foreign languages. The stock of special literature – 149 copies (39 dissertations, 109 author's thesis, 1 reprint). The volume of the special literature stock – 21833, including 6807 in foreign languages. The volume of the general stock – 67478 copies, including 21474 in foreign languages.

On the report period 643 copies of literature was worked out and catalogued 318 cards were included into alphabetical catalogue, 39 cards into dissertations catalogue, 635 cards into general catalogue and card index.

| Year | Book stock | General fond |
|---|---|---|
| 2013 | 19728 | 69855 |
| 2014 | 20006 | 67478 |

## 9. Training of scientific personnel

According to information to 01 December 2014, 250 persons work at the Institute of Mathematics and Mechanics including 150 research associates; 41 doctors of science, 89 philosophy doctors, 4 academicians, 4 corresponding members work at IMM. 27 doctors of science and 30 philosophy doctors work pluralistically at IMM.

| Limit of age | Research associates | | | With scientific degree | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Doctor of sciences | | | Doctor of philosophy | | |
| | total | men | women | total | men | women | total | men | women |
| To 30 age | 9 | 2 | 7 | - | - | - | - | - | - |
| At 30-99 | 42 | 17 | 25 | - | - | - | 30 | 13 | 17 |
| At40-49 | 26 | 19 | 7 | 4 | 4 | - | 19 | 13 | 6 |
| At 50-59 | 37 | 32 | 5 | 10 | 10 | - | 25 | 21 | 4 |
| At 60-69 | 29 | 24 | 5 | 17 | 16 | 1 | 10 | 7 | 3 |
| At 70 and over | 16 | 14 | 2 | 10 | 10 | - | 5 | 3 | 2 |
| Total amount of re-search associates | 159 | 108 | 51 | 41 | 40 | 1 | 89 | 57 | 32 |

In 2014 22 doctoral students were trained, including 14 full-time tuition, 8 postal tuition. 8doctoral students were admitted to IMM
including 2 full time tuition. On 30.12.2014 9 doctoral students will complete the doctoral courses- including 2 full time tuition, 3 postal tuition . This year 27 specialists ( 4 of them on doctor's degree
carry out scientific research work as a candidate for a degree.

By the other N 21 of HCC at the President of Azerbaijan Republic dated from January 21, 2013, the Dissertation Council D.01.111 at the Institute works

in the following specialties: 12.02.01 – Analysis and functional analysis, 1211.01 –Differential Equations, 2002.01 – Mechanics of deformable bodies.

On the report period , the Dissertation Council has held 23 meetings and 21 persons had defended dissertation: 7 doctors of sciences ( 3 of them IMM, ! DSU, 1 ASPU, 1 ASOA, 1 AACU) and 5 philosophy doctors ( 11 from IMM, 2 BSU, 1 ASPU, 1ASOA).

At present 6 dissertation works including 1 for doctor od science and 5 philosophy doctor degrees were represented to the Dissertation Council.

In 2014, 9 doctors of sciences, 12 philosophy doctors received their diploma, 2 professors and 2 associate professors their certificates.

## 10. Material-technical security and financing

On the report year , a great number of works were done on perfection of material-technical resources of the institute. The institute was provided with 6 new modern computer sets, 16 monitors, 2 notebooks, 2 copying machine of A-3 format, 15 metallic shelves for library, 4 computer tables, 1 conference table, 12 chairs , 1 office furniture, 22 jalousies for windows .

In order to improve the working conditions of collaborators full repairs in the fifth floor, in the library, in the rooms scientific and technical information laboratory, in sewage, electric, water systems were carried out, the departments were provided by internet lines.

For normal functioning, the institute was supplied with office equipments. Salaries of staff employees – 536531,74 man., other payments related to the salary, the awards 760.000.00 , contributions to social security foundations- 15000,00 , printing costs – 55114,00, current repairs 50.000, foreign professional trips – 5364,37 , purchase of fuel and lubricants -1200,00. Payment of international telephone conversations – 15,92 , payment of post services 325.00 , purchase of inventory – 20000,00 , purchase of equipment – 10000,00 , other pensions – 600, for temporary loss of ability to work- 262.16 , clerk costs 150 000, computers – 25 000. Doctoral scholarships – 168 000,00, telephone conversations – 454.82 .

## 11. Deficiencies and suggestions

Along with the successes gained in 2014, there are also deficiencies and unsolved problems at the institute.

They are:

-the Institute has not its own building;

-few amount of ptrip expenses makes some difficulties;

-contracting with universities and scientific institutions of masters and research associates sent to the Institute for conducting experiments (financing);

-creation of  financial and technical base for conducting scientific experiments;

Director of IMM NASA  prof. Misir Mardanov