ROMANIAN RESEARCH ASSESSEMENT EXERCISE (RRAE)

EVALUATOR'S GUIDE BOOK

Domain 1: Mathematics

2011

Content

1. Introduction

ROMANIAN RESEARCH ASSESSMENT EXERCISE (RRAE) is the essential component of the *„Doctorate in Universities of Excellence – Research Assessment and Support for Scientific Publishing"* strategic project, a project financed by The Sectorial Operational Programme for the Development of Human Resources (SOPDHR) and undertaken by The Executive Agency for Higher Education, Research, Development and Innovation Funding (EAHERDIF) between2008-2011.

The Exercise's objective is the quantitative and qualitative evaluation, with regards to specific scientific domains and international standards, of the scientific research conducted in Romanian universities. This assessment is based on *The General Methodology* [1], which is further divided by domains in *The specific guide books of the evaluation domains* [2], developed in the project, through the considerable involvement of the national academic community and with the endorsement of an international panel of experts.

At the end of The Exercise for each of the forty two domains of scientific research identified in the project, a hierarchy of Romanian universities will result based on the obtained research performances.

RRAE results will permit formulation of legislative proposals regarding research financing to be strongly connected to the achieved performances and to the perspective of sustainable development of the universities. This perspective will stimulate the competition between universities, the participation of Romanian researchers inthe international networks of research, and the increase of visibility and academic prestige in a global context. At the same time, The Exercise itself proposes to identify the universities whose potential and strategic programme can generate excellence, thus backing the realization of the *Excellency Universities in Romania* programme, a programme elaborated in the frame of the present project [3].

The Assessment Electronic Platform (Romanian acronym **SISEC)** is the informatics infrastructure, developed in the project. SISEC follows three main objectives:

(i). to mediate the introduction by universities of the information on which the evaluation is based (*Data gathering module)*;

(ii). to provide informatics support for the qualitative evaluation in a *peer-review*system (*Evaluation module)*;

(iii).to generate reports on the scientific research conducted in the universities in formats requested by various stakeholders *(Reporting module)*.

The platform will allow the periodical monitoring of research results and the identification of excellence groups whose financial support will contribute to the increase of visibility of Romanian scientific research. As the qualitative evaluation will also be conducted by foreign experts, all the descriptive fields from SISEC will be filled out in English by researchers and domain coordinators from the universities.

The structure of the actual *Evaluator's Guide Book* is the following:

- in **Chapter 2** (*Evaluation Methodology)* the evaluated domains, the four criteria and the accompanying descriptors are shown, next to the duties of participants in the evaluation process;
- in **Chapter 3** (*Electronic Evaluation File)* the structure of *The electronic file* generated by SISEC on the basis of the information introduced by the universities and subjected to both evaluations: quantitative (performed automatically) and qualitative (through *peer-review* activity of the Romanian and foreign evaluation experts), is shown;
- in **Chapter 4** (*Evaluator's work Guidelines*) the steps followed by the evaluator to access SISEC and to perform the qualitative evaluation of the files which are automatically allocated by the electronic platform, are shown in detail;
- in **Chapter 5** (*Panel Coordinator's Work Guidelines*) the responsibilities and the stages followed by the panel coordinator in RRAE are shown.

Further, after the **Bibliography** section, the document contains a detailing of the significance of quality levels specific to each domain, a particularization undertaken by the Evaluation panels for each domain in the process of elaborating the *Evaluation Methodology* (**Annex 1**), the scheduling of meetings of the *Evaluation panels* (**Annex 2)**, *Templates for Reports generated during RRAE* (**Annex 3) and,** finally, explanations of the terms used in RRAE – *Glossary of terms* **(Annex 4).**

2. The Evaluation Methodology

The elaboration of evaluation methodology of scientific research in Romanian universities, on the basis of which the current *Research Assessment Exercise* takes place, was conducted between December 2008 and April 2010 and is presented in detail on the Web page of the project [1 and 2]. The methodology is based on a *peer-review* evaluation process, with national and foreign evaluators, being an evaluation by research domains. The taxonomy of the specialty domains is intended to provide a referential frameworkto The Exercise, highlighting affinities and connections between domains, structured in *Domains groups* and which must be treated consistently by the evaluators. The 42 domains used in RRAE are listed below:

Group I - Natural Sciences

1. Mathematics
2. Informatics
3. Physics
4. Chemistry
5. Geology and geography

Group II- Engineering Sciences

6. Civil engineering and installations
7. Mechanical engineering and mechatronics
8. Aerospatiale engineering
9. Transportation
10. Chemical engineering
11. Materials science
12. Oil, gas and mines
13. Industrial engineering
14. Electrical engineering
15. Energetics
16. Electronics and telecommunications
17. System engineering
18. Computers and information technology
19. Biotechnologies, food security and engineering
20. Environmental sciences

Group III - Social and Economic Sciences

21. Law and administrative sciences
22. Economic sciences
23. Military sciences, security and information
24. Political sciences and international relations
25. Communication and media
26. Sociology, anthropology and social assistance
27. Psychology
28. Education science
29. Sports

Group IV - Human Sciences

30. Philosophy
31. History
32. Theology and religious studies
33. Philology

Group V - Arts and Architecture

34. Cinematography and performing arts
35. Music
36. Visual arts
37. Architecture and urbanism

Group VI – Life Sciences

38. Biology
39. Agriculture and forestry
40. Veterinary medicine and zootechny
41. Medicine
42. Pharmacology

In the current Romanian Research Assessment Exercise the following four criteria are used [1]:

- **Criterion I: The results obtained in the activity of scientific research;**
- **Criterion II: The environment of scientific research;**
- **Criterion III: The prestige in the academic community;**
- **Criterion IV: Financial resources brought for the scientific research.**

Each of these four criteria has a specific weight and a set of descriptors, as follows.

CRITERIA	DESCRIPTORS

I. The results obtained in the activity of scientific research*(Scientific Output)*
 	
(60 – 70 %)
Maximum 3 indicators
	▪ Articles:
	  ▪ Publications rated Web of Science;
	  ▪ Published in proceedings of scientific events;
	  ▪ Magazines from international data base.
	▪ Scientific books of author and chapter books
	▪ Translations
	▪ Patents
	▪ Copyrights Protected Achievements
	▪ Socio-Economic Products (products and/or innovative services with an socioeconomic impact which can be demonstrated)

II. The environment of scientific research *(Research Environment)* **(10 – 30 %)** **Maximum 4 indicators**	▪ PhD Advisors ▪ Organization of Scientific Events ▪ Youth Research Program (Mechanisms to attract young researchers) ▪ Research infrastructure ▪ Access to scientificliterature ▪ Edited volumes ▪ Edited translations
III. The prestige in the academic community*(Academic Recognition)* **(5 – 15 %)** **Maximum 3 indicators**	▪ Invited Professor ▪ Invited Lectures ▪ Citations and reviews of author's creations ▪ Member of Romanian Academy, of branch academies and foreign academies
IV. Financial resources brought for the scientific research (*Research Contracts)* **(5 – 10 %)** **1 indicator**	▪ Funds drawn for researchfrom national and international contracts.

The quantifying of descriptors is done by a set of formulas elaborated by the project team together with the 42 domain coordinators, on the basis of the national and international experience in research

evaluation. The mathematical relations which lead to the numerical values associated to each o evaluation criterion are specified in *The detailed presentation of the evaluation formulas which are going to be used in Romanian Research Assessment Exercise* [4]. The indicators which resulted so forth contain two distinct levels of evaluation: a quantitative and a qualitative one. The quantitative evaluation is automatically performed by the informatics platform, on the basis of the registered information, while the qualitative evaluation is conducted by the evaluators, on the basis of the documents subjected to analysis.

➲ **The evaluation procedure** from a certain research domain follows, successively, the next stages:

1. The qualitative and quantitative evaluation of files by each criterion is done, every file receiving (based on evaluation formulas) four numerical values, each for every criterion.
2. The files are ranked by each criterion, thus resulting in four hierarchies, each for every evaluation criterion.
3. The files from the top of the four hierarchies will receive a maximum number of points (according to [1]). These values are indicated in the table below.
4. The other files receive a number of points which is proportional to the numerical value received for that criterion.
5. The total number of points of university file (for the evaluated domain) is calculated by adding the number of points received for the four criteria.
6. Finally, the ranking of files by a research domain is done depending on the total number of points received.

	Natural Sciences	**Engineering Sciences**	**Social and Economic Sciences**	**Humanist Sciences**	**Arts and Architecture**	**Life Sciences**
Criterion I	70 points	65 points	60 points	60 points	60 points	60 points
Criterion II	10 points	15 points	15 points	15 points	30 points	20 points
Criterion III	10 points	10 points	15 points	15 points	5 points	10 points
Criterion IV	10 points	10 points	10 points	10 points	5 points	10 points

The maximum points corresponding to the four criteria for each group of domains established in The General Methodology of Evaluation [1].

➲ **By researchers, according to this guide, we understand the didactic staff and the researchers employed bythe university as of 31-st of December 2010.**

Each researcher will have an individual account in **Assessment Electronic Platform (**Romanian acronym*SISEC),* through which she/he will introduce all the information subject to evaluation.

Attending PhD students who don't have an employment contract with the university will have an individual account in **Assessment Electronic Platform (**Romanian acronym*SISEC)* by which they will introduce all the information subject to evaluation.

Criterion I, II and III imply both a quantitative evaluation (automatically achieved by SISEC) and a qualitative one, performed by the evaluators through the framing of the elements subjected to the qualitative evaluation by quality levels. Criterion IV contains just the quantitative component. The information necessary for the evaluation by the criteria I and III are obtained from the individual data introduced in SISEC by the researchers, while the information needed for the evaluation of the Criterion IV are introduced by the domain coordinator from the university. At the criterion II the information required by the „PhD Advisors" descriptor are introduced by the researchers (if they have the position of a doctorate supervisor), the rest of the information being introduced by the domain coordinator from the university.

- RRAE calls for two categories of actors involved in the process:
  - **the universities,** represented by *rectors, domain coordinators, researchers and* attending *PhD students* (they don't have an employment contract with the university);
  - **the national and foreign evaluators**.

At the **university** level, ***the rector*** selects from the list of the forty two domains subjected to evaluation the domains which are covered in the university. The rector will also establish the domain coordinators and the list of researchers and post-graduates for each research domain; he/she will introduce and will validate through the platform the data required at the university level and in the end he/she will validate all the elements which will be entered into the evaluation process. On the basis of the lists with the identification data of the researchers and the PhD students and of the list with the identification data of the domain coordinators, established by the rectors, the accounts for the domain coordinators, researchers and post-graduates will be generated.

The domain coordinators the person appointed by the rector as a responsible for the research evaluation for a certain domain covered by the respective university. He/She introduces the information for criteria II (*Research Environment*) and IV (*Research Contracts*), debugs the error messages (SISEC) and validates the data introduced by the researchers in the respective domain.

The researchers and the PhD students will register in SISEC the scientific production (Criterion I) and each researcher who has a non-null scientific production on a certain descriptor has to introducein SISEC, for the qualitative evaluation, 10% (but not less than one element) from the scientific production accompanying that descriptor (for example, articles, books and so on). The researchers will register in SISEC

the accompanying information to the prestige in the academic community (Criterion III), also. The researchers who have the right to supervise doctorates will introduce in Criterion II (*Research Environment*) the information afferent to „PhD Advisors" descriptor; the rest of the information specific to The Criterion II shall be introduced by the domain coordinator.

The evaluators have access, through SISEC, to the integral electronic files allocated for the evaluation, thus having the possibility of a complete picture of the achieved performances in scientific research for the universities, by the evaluated domains.

The national and foreign evaluators will analyze from the qualitative point of view a part of the information registered by the universities with the electronic platform as follows:

- For Criterion I, the qualitative evaluation is done only for 10% of the scientific production. For every element subjected to the qualitative analysis in the frame of Criterion I (articles, books etc.), the evaluators will choose explicitly one of the four quality levels described below.
- For criteria II and III all the information introduced in SISEC by the universities will be qualitatively evaluated. The evaluators will indicate just the number of elements (for example, scientific events, edited volumes and so on) accompanying each quality level.

According to General methodology of evaluation [1], in the frame of RRAE, the evaluators will choose for each element subjected to qualitative evaluation one of the following four quality levels:

- **top international;**
- **international;**
- **national;**
- **local.**

The detailed description of these levels of quality is specific to each evaluation domain and it is presented in **Annex 1** of the current Guide Book.

3. The Electronic Evaluation File

The electronic evaluation file (later called *Evaluation file* or just *File*) is associated to a domain of science from a certain university and it contains **the entire information** provided by the University for (quantitative and qualitative) evaluation in RRAE, by the respective domain.

Beside the elements subjected to the evaluation, t*he evaluation file* also contains the general information specific to the university and the evaluated domain.

The electronic file is organized in three sections:

Section I: **General data** which contain the following information:

I.1 General data about the university introduced by Rector;

I.2 General data about the evaluated domain introduced by the domain coordinator (number of researchers, number of PhD students, specific information domain available for the domain coordinator);

I.3 Information about the number of elements uploaded toSISEC for each Criterion and Descriptor.

SectionII: **Data for *qualitative evaluation***, where will be presented to the evaluator the elements subjected to the evaluation, *in an interactive way,* on each descriptor as follows:

- at **Criterion I** for each descriptor 10% of the scientific production will be posted (the selection of the elements being done by the researchers);
- at **Criteria II and III** all data will be posted.

Every element subjected to the qualitative evaluation, together with the afferent information (text domains, *.pdf files, etc.), will be accompanied by a *drop-down list,* through which the evaluator will select one of the quality levels (top international, international, national or local) and by a text area, where the evaluator will provide the arguments for his decision.

Section III: ***Integral data,*** which allows the evaluator *to visualize* the entire information referring to the evaluated domain, introduced for the domain by the researchers, domain coordinators and university, for **all four evaluation criteria.**

The electronic platform (SISEC) ensures a functionality by which the electronic file can be saved in a *.pdf file format), a file which can be stored on a removable storage (e.g. DVD) or can be printed. This Electronic file will be validated by the domain coordinator from the university and in the end by the Rector before the assessment process begins.

4. Evaluator's work guidelines

The evaluators are prestigious researchers from Romania and abroad, selected after a large consultation of the academic community. They will analyze and assign one of the four quality levels defined in G*eneral methodology of evaluation* [1], the information registered by the universities in SISEC and destined for the qualitative evaluation. These represent 10% of the total of information from Criterion I. They will also evaluate the integral information uploaded at Criteria II and III.

In RRAE, the evaluators will perform their activity, successively following these stages:

Stage I: *online*

a. The evaluator accesses SISEC using the identification data (*username, password)* received by *e-mail* from the electronic platform administrator;

b. See *The Evaluator Guide Book* specific to the domain.
This guide is available in English, in his/her SISEC work space. When he/she has doubts/questions regarding the unfolding of the evaluation procedure, the evaluator can consult the Panel Coordinator;

c. In his/her work space, he/she identifies the electronic files which were automatically allocated to him/her by the electronic system for the qualitative evaluation. For each file, if conflicts of interests are not detected, he/she will accept the file for the evaluation, selecting the proper option from SISEC. If not, he/she refuses the file evaluation and he/she will receive another file for the evaluation, from the Evaluation panel coordinator.

d. The proper qualitative evaluation of each file:
   i. The evaluator will examine the entire file (the second section of *The evaluation electronic file*) in order to make an overview of the evaluated domain from the university;
   ii. As presented in Chapter 2 (of this guide book), *the qualitative evaluation will be done only for 10% of the scientific production* (Criterion I) and *integrally* for Criteria II and III. The elements subjected to the qualitative evaluation are included in the first section of *The evaluation electronic file,* file available to the evaluator. For each of these elements, SISEC will make available to the evaluator all the information introduced by the universities for the qualitative evaluation (e.g. files in *.pdf format containing the scientific article, book,chapter, etc.);
   iii. For each element subjected to the qualitative evaluation, based on the existing information in SISEC, the detailed description of the quality levels presented in **Annex**

1and the personal scientific expertise, the evaluator must choose one of the four quality levels and provide (in the respective domain from SISEC) arguments for the choice he/she made.

e. At the end of the qualitative assessment process of a file, the evaluator will fill in and will sign *The evaluation report* (see **Annex 3** of this guide book) for that file. This report will contain statistical data resulted after the evaluation (data automatically generated by SISEC), together with the general notes/assessments of the evaluator for that file. The report will be electronically filled in, on SISEC, immediately after the *online* evaluation, will be subsequently printed, signed by the evaluator and sent to the project management team.

Stage II: in panel

a. For the Panel meeting , the evaluator will check the other evaluators'assessment results (without knowing their identities) and the arguments already presented by them, results accessible in SISEC only after the *online* evaluation stage is completed, when the evaluators can no longer modify the assessments.
b. The evaluator is invited to attend the meeting (working session) of The Evaluation Panel, a meeting mediated by the Evaluation Panel Coordinator. The schedule of the Panel meetings is shown in **Annex 2** of this guide book;
c. The evaluator will be able to participate in the on-site visit at the evaluated universities, a visit which will be correlated with the panel meeting, elaborating *A report on the on-site visit for the domain*, according to the model shown in **Annex 3** of this guide book. The scheduling and participation in the on-site visits will be established by the project management team;
d. The evaluator will participate to the elaboration and he/she will sign *The report of the meeting in the Panel,* according to the model shown in **Annex 3** ofthis guide book;
e. The evaluator will sign, alongside the other members of the Panel and the Panel coordinator, *The final report of the ranking of files by domains,* according to the model shown in **Annex 3** of this guide book.

5. Panel Coordinator's work guidelines

As established in *General Methodology* [1], the Panel Coordinator doesn't evaluate the universities' files, his/her role being that of coordinating the activity of The evaluation panel, of mediating the discussions from the Panel in order to reach a consensus in establishing the quality levels subjected to the qualitative evaluation and to conduct the reports generated in the assessment process, reports whose model is shown in **Annex 3** of this guide book. His/her activity will follow the next steps:

Stage I: *online*

a. He/she logs on to SISEC, using the *username* and the *password* received by *e-mail,* from the platform's administrator;
b. Consults *The Evaluator Guide Book* specific to the domain. This guide is available in English, in his/her work space at SISEC;
c. In his/her work space, he/she identifies the files uploaded by the universities and the complete list of the evaluators from the Panel he/she coordinates;
d. He/she identifies the way SISEC automatically allocated the files to the evaluators and points out to the management team of the project the eventual incompatibilities;
e. He/she receives (by SISEC) from the evaluators the agreement/refuse to assess the allocated file. In a case of a refused file, he/she allocates that file to another evaluator, pointing out this allocation to the project management team;
f. During the *online* qualitative evaluation, the panel coordinator solves the eventual doubts/questions received from the evaluators. If it's necessary, he/she contacts the project management team;
g. He/she points out to the project management team any dysfunctionality which can show up during the *online* qualitative assessment.

Stage II: On-site Visits and Panel Meeting

a. He/she prepares the field visits and the panel meeting, assuring the fact that all the evaluators had accessed/visualized the results of the *online* qualitative evaluation done by the other members of The Panel;
b. He/she mediates the discussions in The Panel in order to reach a consensus on the allocation of the quality levels for all the elements subjected to the qualitative evaluation;

c. After the discussions in the panel meeting finalize, he/she assures the filling in and the signing by the participants of *The Report of the meeting in Panel*;
d. Based on *The Report of the panel meeting,* he/she introduces in SISEC (with the technical support of the Panel assistant) the final values of the quality levels for the elements subjected to the qualitative evaluation.

Stage III: Finalizing the evaluation process and the classification of the universities on the domain

a. Using the final results of the evaluation (quantitative and qualitative) provided by SISEC, he/she fills in and signs together with the other members of The Evaluation Panel *The Final report of the raking of files by domain*(according to the model from **Annex 3** of this guide book);
b. He/ she gives to the project management team this *Final report* on the evaluation in RRAE;
c. For the file with the highest score, he/she presents a comparison concerning the elements from **Criterion I** with the top universities in Europe, conducting A *Report of* benchmarking (according to the model from **Annex 3**).

Bibliography

[1] *The General Methodology of Evaluation of the Higher Education Scientific Research Quality,* October, 2009, http://www.ecs-univ.ro/UserFiles/File/Metodologie%20Generala%20cu%20Anexe.pdf

[2] *The Guide Books Specific To The Evaluation Domains,* September 2010, http://www.ecs-univ.ro/

[3] *„Excellency Universities in Romania"* Programme, http://www.ecs-univ.ro/517/section.aspx/539

[4] *The Detailed Presentation of the Evaluation Formulas of What is Going To Be Used in The ROMANIAN RESEARCH ASSESSMENT EXERCISE,* November 2010, http://www.ecs-univ.ro/

Annex 1. Particularization of the quality levels meaning according to the specific methodology of the domain Mathematics[2]

The descriptors and the quality factors specific to the three qualitatively evaluated criteria, for the Mathematics panel are presented below.

Criterion I: The results obtained in the activity of scientific research

In the frame of this criterion the analysis of the scientific production of each researcher reported by the university in the Mathematics domain is taken into consideration. The evaluation is both qualitative and quantitative and it is realized on the basis of the individual information of the researchers.
The descriptors are:

- *Scientific articles*

Description: Only the ISI articles published in the last five years will be taken into consideration, which have the evaluated university as the institutional affiliation. The WSEAS articles will not be evaluated.

Quality factor: On the basis of the selective analysis of the scientific articles, taking into consideration the number of quotations, the importance of the obtained results, the quality of the magazines where it has been published etc., the evaluator allocates globally to the descriptor, one the following marks (F_c):

Top international level

- Articles published in the first 1/8 part of ISI lists for different areas of mathematics domain.

International level

- Articles published in the second 1/8 part of ISI lists for different areas of mathematics domain.

National level

- Articles published in the second 1/4 part of ISI lists for different areas of mathematics domain.

Local level

- Articles published in the second half part of ISI lists for different areas of mathematics domain.

- *Books and books chapters*

Description: The scientific books of author published at the foreign publishing houses (Academic Press, Wiley, Oxford University Press, Cambridge University Press, Elsevier, Springer, Birkhauser, CRC Press, World Scientific), the chapters of scientific books published at the foreign publishing houses mentioned above and the scientific books of author published at the Romanian Academy Publishing House and Technical Publishing House will be taken into consideration. Only those books and book chapters which have the evaluated university as the institutional affiliation will be taken into consideration. Books with a didactic character are excluded from the evaluation.

Quality factor:

Top international level

- Volumes (chapters of books) with a strong impact to the development of a domain's research, quoted a large number of times.
- The International level of the publishing house.

International level

- Volumes (chapters of books) published in international publishing houses with a lower visibility.
- The International level of the publishing house

National level

- Volumes (chapters of books) published in the Romanian Academy Publishing House, Technical Publishing House, possibly in an international circulation language.

Local level

- There is no local level

- *Patents*

Description: National patents, international patents, which have the evaluated university as the institutional affiliation, will be taken into consideration.

Quality factor:

Top international level

- applied patents, with a strong impact in the development of a technology or a product
- USA, JAPAN

International level

- International patents, which aren't applied in practice.
- EUROPE

National level

- national patents applied in the productive sector

Local level

- national patents which aren't applied in practice

Criterion II: The background of scientific research

In the frame of this criterion the dynamics of the background of the scientific research in the Mathematics domain is analyzed, on the basis of the individual information of the researchers and of the information which was directly received from the university.

The descriptors are:

- *PhD advisors*

Description: The quality of the PhD advisors is determined by the evaluators on the basis of the publications resulted from the doctoral theses. It will observed whether young Ph.D. students, after getting their Ph.D., obtained postdoctoral stages in prestigious institutions or ones which are financed by famous organizations (Humboldt Foundation, Marie Curie scholarships, important foreign universities etc.). Also, the professional route of the young Ph.D. students after they received their Ph.D. will be observed.

Quality factor: Is established depending on:

(1) The number and the average quality of the publications resulted from the finalized doctoral theses. The same quality factors as in the scientific articles from Criterion I are used.

(2) The number of the young Ph.D. students who, after getting their Ph.D. were accepted at prestigious universities (Shanghai and /or Times classification) to attend post-doctoral stages.

Top international level

- Marie Curie, Humboldt, JSPS scholarships or that of the universities from Top 100;

International level

- post-doctoral scholarships in universities from Top 500;

National level

- Romanian universities or Institutes of the Romanian Academy.

There is no local level

- *Access to scientific literature*

Description: Research activity of an international level can't be achieved in the absence of up to date documentation sources. The number of the subscriptions from one university to journals from the Mathematics domain will be observed.

Quality factor: Is established depending on the international or national importance of the magazines/publishing houses to which the university has access.

Top international level

- Subscriptions to the MathSciNet, Wiley, ScienceDirect.
- Specialty monographs published by the great international publishing houses in the last 5 years.

International level

- Subscriptions to MathSciNet , ScienceDirect, Springer.
- Specialty monographs published abroad.

National level

- Subscriptions or collections of scientific magazines of reduced importance.
- Specialty monographs published in Romanian language.

Local level

- Libraries with an especially didactic material.

- *Mechanisms to attracting young researchers*

Description: The research activity presupposes a competitive infrastructure and researchers with concerns which are synchronous with those from world research, which can attract foreign and Romanian postdoctoral researchers. The number of the postdoctoral researchers from a university, who are active in the Mathematics domain, will be observed.

Quality factor: Is established depending on:

(1) the offered research topic (ongoing projects, their originality and actual character);

Top international level

- participation to the excellence networks of the European Union;
- Participation to FP6, FP7 projects etc.

International level

- Participation to the bilateral international projects, conventions of collaboration with universities from abroad.

National level

- CNCSIS, PNII grants, those of the Academy

Local level

- Collaborations which don't fit in the previous situations

Criterion III: The prestige in the academic community

In the frame of this criterion the prestige by the academic community of the researchers of a university who are active in the Mathematics domain is analyzed. The analysis is done on the basis of the individual information from the researchers.

The descriptors are:

- *Papers invited to famous international conferences*
- *Visiting professor at the famous universities*
- *Quotations*

Quality factor: On the basis of the information filled in by each researcher in the respective field of the descriptors for criterion III, an university can receive, for a certain domain, one of the following marks:

Top international level

International level

National level

Local level

The following are added to the marks above:

(1) The number of invited conferences (*plenary lectures*, *invited lectures*, *keynotes*) to the international conferences/congresses;

(2) invited seminars to prestigious universities;

(3) The number of visiting professor positions to prestigious universities;

(4) Awarded prizes.

Criterion IV: Financial resources brought for the scientific research

The evaluation with regards to criterion IV is totally quantitative, being achieved automatically by the informatics platform of the assessment, without the involvement of the evaluation experts. This evaluation is done on the basis of the research contracts reported by a university for a certain domain, for the evaluated period.

Annex 2. Panel Meetings Schedule

Period	Panels					
22th – 24th of August 2011	P4 - **Chemistry**	P7 - **Mechanical engineering and mechatronics**	P27 - **Psychology**	P34 – **Cinematography and performing arts**		
24 th - 26 th of August 2011	P32 - **Theology and religious studies**	P8 - **Aerospatiale engineering**	P21 - **Law and administrative sciences**	P2 - **Informatics**		
29 th - 31st of August 2011	P1 - **Mathematics**	P37 - **Architecture and urbanism**	P30 - **Philosophy**	P26 - **Sociology, anthropology and social assistance**	P14 - **Electrical engineering**	P29 - **Sports**
30 th August - 1st September 2011	P28 - **Education science**	P31 - **History**	P35 - **Music**			
31st - 2nd September 2011	P12 - **Oil, gas and mines**	P9 - **Transportation**	P11 - **Materials science**	P18 - **Computers and information technology**	P33 - **Philology**	
5 th - 7 th of September 2011	P42 - **Pharmacology**	P5 - **Geology and geography**	P24 - **Political sciences and international relations**	P13 - **Industrial engineering**	P20 - **Environmental sciences**	
6 th - 8 th of September 2011	P10 - **Chemical engineering**	P17 - **System engineering**	P16 - **Electronics and telecommunications**	P23 - **Military sciences, security and information**	P15- **Energetics**	
7 th - 9 th of September 2011	P40 - **Veterinary medicine and zootechny**	P41 - **Medicine**	P36 - **Visual arts**			
12 th - 14 th of September 2011	P38 – **Biology**	P3 - **Physics**	P6 - **Civil engineering and installations**	P19 - **Biotechnologies, food security and engineering**	P39 - **Agriculture and forestry**	P25 - **Communication and media**
15 th - 17 th of September 2011	P22 - **Economic sciences**					

Annex 3. Templates for Reports generated during RRAE

1. *The online evaluation form*.

ROMANIAN RESEARCH ASSESSEMENT EXERCISE (RRAE)

Evaluation form

Identification data:

Evaluated university

Evaluated domain

Criterion I – The results obtained in the activity of scientific research

Articles

Total number of articles uploaded | |
Number of articles selected for qualitative evaluation | |
(generated by SISEC)

Top international level (I_{iv}= 1,2):	
International level (I_i = 1):	
National level (I_n = 0,9):	
Local level (I_l =0,7):	

Fc,g,a = (are generated automatically by the platform)

Books and chapters

Total number of books and chapters uploaded | |
Number of books and chapters selected for qualitative evaluation | |
(are generated automatically by the platform)

Top international level (I_{iv}= 1,2):	
International level (I_i = 1):	
National level (I_n = 0,9):	
Local level (I_l =0,7):	

Fc,g,c = (are automatically generated by the platform)

Patents

Total number of patents uploaded
Number of patents selected for qualitative evaluation
(are generated automatically by the platform)

Top international level (I_{iv}= 1,2):	
International level (I_i = 1):	
National level (I_n = 0,9):	
Local level (I_l =0,7):	

Fc,g,b = (are generated automatically by the plaform)

Translations

Total number of translations uploaded
Number of translations selected for qualitative evaluation
(are generated automatically by the platform)

Top international level (I_{iv}= 1,2):	
International level (I_i = 1):	
National level (I_n = 0,9):	
Local level (I_l =0,7):	

Fc,g,tr = (are generated automatically by the plaform)

Socio-Economic Products

Total number of products uploaded
Number of products selected for qualitative evaluation
(are generated automatically by the platform)

Top international level (I_{iv}= 1,2):	
International level (I_i = 1):	
National level (I_n = 0,9):	
Local level (I_l =0,7):	

Fc,g,p = (are generated automatically by the plaform)

Copyrights Protected Achievements

Total number of achievements uploaded

Number of achievements selected for qualitative evaluation

(are generated automatically by the platform)

Top international level (I_{iv}= 1,2):	
International level (I_i = 1):	
National level (I_n = 0,9):	
Local level (I_l =0,7):	

Fc,g,r = (are generated automatically by the plaform)

Evaluator's general notes regarding Criterion I

Criterion II – The background of scientific research

PhD Advisors

Total number of PhD advisors [ ]
(are generated automatically by the platform)

Top international level (I_{iv}= 1,2):	
International level (I_i = 1)"	
National level (I_n = 0,9):	
Local level (I_l =0,7):	

Fc,g,cd = (are generated automatically by the platform)

Organization of Scientific Events

Total number of events [ ]
(are generated automatically by the platform)

Top international level (I_{iv}= 1,2):	
International level (I_i = 1):	
National level (I_n = 0,9):	
Local level (I_l =0,7):	

Fc,g,ms =(are generated automatically by the platform)

Access to scientific literature

Number of subscriptions to domain specific journals [ ]
Total number of journal subscriptions in the university [ ]
(are generated automatically by the platform)

Top international level (I_{iv}= 1,2):	
International level (I_i = 1):	
National level (I_n = 0,9):	
Local level (I_l =0,7):	

Fc,g,al = (are generated automatically by the platform)

Youth Research Program

Number of researchers under 35 years of age ☐

Total number of researchers ☐

Total number of evaluated programs ☐

(are generated automatically by the plaform)

Top international level (I_{iv}= 1,2):	
International level (I_i = 1):	
National level (I_n = 0,9):	
Local level (I_l =0,7):	

Fc,g,ptc = (are generated automatically by the platform)

Research infrastructure

Total sum of money invested in the domain specific infrastructure ☐

Total number of evaluated infrastructure elements ☐

(are generated automatically by the platform)

Fc,g,i = are introduced in SISEC by the evaluator as a single value for the entire infrastructure related to the evaluated domain

Edited volumes

Total number of edited volumes ☐
(are generated automatically by the platform)

Top international level (I_{iv}= 1,2):	
International level (I_i = 1):	
National level (I_n = 0,9):	
Local level (I_l =0,7):	

Fc,g,v = (are generated automatically by the platform)

Edited translations

Total number of edited translations and volumes
(are automatically generated by the platform)

Top international level (I_{iv}= 1,2):	
International level (I_i = 1):	
National level (I_n = 0,9):	
Local level (I_l =0,7):	

Fc,g,tv = (are automatically generated by the platform)

Evaluator's general notes regarding Criterion II

Criterion III – The prestige in the academic community

Total number of researchers with positive scientific results

Total number of researchers in the domain

Number of evaluated elements
(are generated automatically by the platform)

Top international level (I_{iv}= 1,2):	
International level (I_i = 1):	
National level (I_n = 0,9):	
Local level (I_l =0,7):	

Fc ,g,rc = (are generated automatically by the platform)

Evaluator's general notes regarding Criterion III

Criterion IV – *Research Contracts*

Domain specific income attracted from contracts at a national level	
Domain specific income attracted from contracts at an international level	
Total numbers of researchers in the specific domain *(are generated automatically by the platform)*	

Evaluator's general notes regarding Criterion IV

Date

Expert's first and last name

Expert's signature

2. *Report for visits on Universities*.

ROMANIAN RESEARCH ASSESSEMENT EXERCISE (RRAE)

On-site evaluation form

General data:

Evaluated University

Evaluated domain

Criterion II – The background of scientific research

Research infrastructure *(the list with the infrastructure elements uploaded to SISEC and a column with the evaluator's remarks)*

Infrastructure list uploaded to SISEC | | *(automatically generated by the platform)*

Total sum invested in infrastructure on domain | |

Fc,g,i = fill out by the evaluator as an unique value for the entire evaluated domain infrastructure

Evaluator's general notes

Organization of Scientific Events

The list of scientific events uploaded to the platform (a column with the quality level for each meeting must be added; from on-line and field evaluation*)* | |

(automatically generated by the platform)

Evaluator's general notes

Access to scientific literature

The list of elements uploded to the platform (a column with the quality level for each element must be added; from on-line and field evaluation*)*
(automatically generated by the platform)

Evaluator's general notes

Youth Research Program

The list of elements uploded to the platform (a column with the quality level for each element must be added; from on-line and field evaluation*)*
(automatically generated by the platform)

Evaluator's general notes

Criterion IV – *Research Contracts**(the list of the elements uploded to SISEC)*

Evaluator's general notes

Date

On-site evaluation team

Last name and first name of the expert	**Signature**

3. *Panel meeting report.*

ROMANIAN RESEARCH ASSESSEMENT EXERCISE (RRAE)

Panel report

General data:

Evaluated university

Evaluated domain

Criterion I – The results obtained in scientific research

Articles

Total number of uploaded articles	
Number of selected articles for quality assessment *(generated by SISEC)*	

Top international level (I_{iv}= 1,2):	
International level (I_i = 1):	
National level (I_n = 0,9):	
Local level (I_l =0,7):	

Fc,g,a = (automatically generated by the platform)

Books and book chapters

Total number of uploaded books and book chapters	
Number of selected books and book chapters for quality assessment *(automatically generated by the plaform)*	

Top international level (I_{iv}= 1,2):	
International level (I_i = 1):	

National level (I_n = 0,9):	
Local level (I_l =0,7):	

Fc,g,c = (automatically generated by the platform)

Patents

Total number of uploaded patents
Number of selected patents for quality assessment
(automatically generated by the platform)

Top international level (I_{iv}= 1,2):	
International level (I_i = 1):	
National level (I_n = 0,9):	

Fc,g,b = (automatically generated by the platform)

Translations

Total number of uploaded translations
Number of selected translations for quality assessment
(automatically generated by the platform)

Top international level (I_{iv}= 1,2):	
International level (I_i = 1):	
National level (I_n = 0,9):	
Local level (I_l =0,7):	

Fc,g,tr = (automatically generated by the platform)

Socio-Economic Products

Total number of uploaded products
Number of selected products for quality assessment
(automatically generated by the platform)

Top international level (I_{iv}= 1,2):	
International level (I_i = 1):	
National level (I_n = 0,9):	

Local level (I_l =0,7):	

Fc,g,p = (automatically generated by the platform)

Copyrights Protected Achievements

Total numbers of uploaded achievements
Number of selected achievements for quality assessment
(automatically generated by the platform)

Top international level(I_{iv}= 1,2):	
International level (I_i = 1):	
National level(I_n = 0,9):	
Local level (I_l =0,7):	

Fc,g,r = (automatically generated by the platform)

General notes of assessment panel for Criterion I

Criterion II – Scientific research enviroment

PhD Advisors

Total number of PhD Advisors ☐
(automatically generated by the platform)

Top international level(I_{iv}= 1,2):	
International level (I_i = 1):	
National level (I_n = 0,9):	
Local level (I_l =0,7):	

Fc,g,cd = (automatically generated by the platform)

Organization of Scientific Events

Total number of events ☐
(automatically generated by the platform)

Top international level(I_{iv}= 1,2):	
International level (I_i = 1):	
National level (I_n = 0,9):	
Local level (I_l =0,7):	

Fc,g,ms = automatically generated by the platform

Access to scientific literature

Number of subscriptions to journal in the field ☐
Total number of university subscriptions to journals ☐
(automatically generated by the platform)

Top international level(I_{iv}= 1,2):	
International level (I_i = 1):	
National level (I_n = 0,9):	
Local level (I_l =0,7):	

Fc,g,al = (automatically generated by the platform)

Youth Research Program

Numbers of researchers under 35

Total number of researchers

Total number of evaluated programs

(automatically generated by the platform)

Top international level(I_{iv}= 1,2):	
International level (I_i = 1):	
National level (I_n = 0,9):	
Local level (I_l =0,7):	

Fc,g,ptc = automatically generated by the platform

Research infrastructure

Total investment in the infrastructure

Total number of evaluated infrastructure elements

(automatically generated by the platform)

Fc,g,i = fill out by the evaluator as an unique value for the entire evaluated domain infrastructure

Edited volumes

Total number of edited volumes
(automatically generated by platform)

Top international level(I_{iv}= 1,2):	
International level (I_i = 1):	
National level (I_n = 0,9):	
Local level (I_l =0,7):	

Fc,g,v = automatically generated by the platform

Edited translations

Total number of edited translations and books
(automatically generated by platform)

Top international level(I_{iv}= 1,2):	
International level (I_i = 1):	
National level (I_n = 0,9):	
Local level (I_l =0,7):	

Fc,g,tv = (automatically generated by the platform)

General notes of assessment panel for Criterion II

Criterion III – The prestige in the academic comunity

Number of researchers with non-zero scientific production

Total number of researchers in a domain

Number of evaluated elements

(automatically generated by platform)

Top international level(I_{iv}= 1,2):	
International level (I_i = 1):	
National level (I_n = 0,9):	
Local level (I_l =0,7):	

Fc ,g,rc = (automatically generated by the platform)

General notes of assessment panel for Criterion III

Criteriul IV – ***Research Contracts***

Funds attracted for research from national competitions	
Funds attracted for research from international competitions	
Total number of researchers *(automatically generated by the platform)*	

General notes of assessment panel for Criterion IV

Date

Assessment panel

Last and first name of expert	Signature

4. *Final ranking report.*

ROMANIAN RESEARCH ASSESSEMENT EXERCISE (RRAE)

Final ranking report

Domain

Table 1

Numeric values associated to criteria I-IV (SISEC)

University code	University	Criterion I	CriterionII	Criterion III	CriterionIV
	U1	Val(U1)	Val(U1)	Val(U1)	Val(U1)
	U2	Val(U2)	Val(U2)	Val(U2)	Val(U2)
	U3	Val(U3)	Val(U3)	Val(U3)	Val(U3)
	⋮	⋮ .	⋮ .	⋮ .	⋮ .

Table 2

Numeric values associated to criteria I-IV ranked low (SISEC)

Criterion I	CriterionII	Criterion III	CriterionIV
Val(University code)	Val(University code)	Val(University code)	Val(University code)

Table 3

Scores corresponding to values from Table 2 (based onAnnex 1)

Criterion I	CriterionII	Criterion III	CriterionIV
P(Ui)	P(Uj)	P(Uk)	P(Um)

Table4

Scores obtained by Universities in ENEC

University code	University	Score Criterion I	Score Criterion II	Score Criterion III	Score Criterion IV

Date

Assessment panel

Last and first name of expert	Signature

Annex 1: tables of scores from general methodology

Annex 2: Universities codes

5. *International benchmarking* report.

ROMANIAN RESEARCH ASSESSEMENT EXERCISE (RRAE)

FISA de benchmarking

General data:

Evaluated University

Domain

Website

Researchers number (in the evaluated domain)

Total number of researchers:

- Professors
- Associated professors
- PhD

Criterion I – The results obtained in scientific research

- **Number of articles**

- **Other relevant results**

Data

Panel Coordinator,

Signature

Annex 4. Glossary of terms used in RRAE

In this section are specified the meanings of the main terms used for the application of this guide book.

Published article: adocumentpublished by the author/authors**.** In this case, there are taken into consideration the articles published in ISI indexed journals or in prestigious international data basis.

Patent of invention: a title of protection which gives to the titular an exclusive right of exploitation of the invention object and also the right to forbidden to the third persons (physical and judicial persons) to exploit the invention object.

The university's capacity of supporting postdoctoral programmes: the existence of the human and financial resources at the level of the university and also of a postdoctoral programme.

Scientific book: book written on the basis of the proper scientific activity. The didactic papers are excluded.

Research: creative activity which brings a contribution to knowledge, understanding and innovation with an economic relevance.

Researcher: is the person involved in the conceiving or creating of new knowledge, products, processes, methods and systems and also in their management. The definition refers to any person who is professionally involved in the research-development activity, in any stage of his/her career, regardless of classification. This includes any type of research: basic, strategic, applied ones, experimental development and knowledge transfer, innovation and counseling, supervision and training capacities, knowledge and intellectual copy rights management, the exploitation of the research results or scientific publishing.

Researcher subjected to RRAE evaluation is the employed person with the basic norm (with an individual labour contract) in the university, at 31-st of December, 2010.

PhD Advisor: can be an academician, a correspondent member of Romanian Academy, a full professor and a scientific researcher degree I, who got the legal right to supervise post graduates.

RRAE domain coordinator:the employed person with the basic norm (with an individual labour contract) in the university, at 31-st of December, 2010 and who is appointed by the Rector as responsible for the research evaluation from a certain domain covered by the respective university.

Evaluation criteria: principles on the basis which is done the classification of the universities from Romania as far as the research activity concerns. In the actual methodology, there are taken into account four criteria for the research evaluation from the universities.

Evaluation domain: is one of the forty two research domains described in this guide book.

The Romanian Research Assessment Exercise (RRAE or „the exercise"): an instrument of measuring the research quality from the universities from Romania, and also of identification of the universities with a potential of becoming excellency universities.

Quality factor: a factor settled by the evaluator experts on the basis of the qualitative analysis of the documents from the evaluation file.

Impact factor: the average number of citations from a year of the articles published by the researcher in the preceding two years.

Evaluation indicator: the numerical quantified form of a descriptor.

Innovation: activity oriented to the generating, assimilating and valuing of the results of the research-development in the economic and social area.

Invited papers at prestigious international conferences: papers presented at international conferences and published in the documents of that conference.

University mechanisms for attracting young researchers: the existence of some proper instruments at the university level (example: research programme) and financial facilities dedicated to the young researchers.

Research Evaluation Methodology: assembly of proceedings (information and integrated procedures) used in the achievement of the research activity evaluation on scientific domains, from the universities from Romania.

Products and innovative services: products/services with an economic impact provable by the effects produced by their application.

Visiting professor at prestigious universities: professor invited at a famous university for a long term period.

Achievements subjected to copy right law: achievements referring to creation, defined as a process of research and innovation from the domains: architecture and art.

The research results: the contribution to knowledge, understanding and innovation, with a socio-economic relevance.