**Center for Research and Training in Innovative Techniques
of Applied Mathematics in Engineering (*CiTi)*,**
Faculty of Applied Sciences,
University Politehnica of Bucharest

**Cipu Elena Corina
Membru CiTi,**
Coordonator direcție cercetare **Algoritmi evolutivi şi aplicaţii**

Raport cercetare 2021   **Tip activitate: Activitate de cercetare și instruire**

Martie 2021

ThinkBS Basic Sciences in Engineering Education, Session 3: Majors in mathematics?

Elena Corina Cipu, Simona Mihaela Bibic, Mihai Rebenciuc, Antonela Toma, *What Mathematical Knowledge must be achieved in an Engineering Career?*
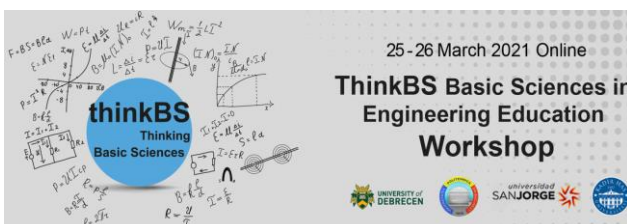
Abstract
Mathematics in engineering education is the art of applying maths to complex realworld problems, combining mathematical theory, practical engineering, and scientific computing to address today's technological challenges.
Core exercises for a human body are those which construct the strength and sustain an equilibrium to the whole system, put it in an initial state for healthy and good immunity. Likewise, what core mathematics should be studied by engineering students and how should it be defined?
The key to technical skill for training engineering students to be mathematicians is mathematical modeling. Problem-solving of this kind is best-learned through practical experience, and how engineering students learn, e.g., using case-study applications which include engineering, life sciences, medicine, climate science, energy, data science, robotics, and more. Therefore, different mathematical modeling units feature in all technical degree programs where the students often work in teams to tackle challenging, open-ended issues, putting theory into practice.
In this paper, we analyze and answer some essential questions, such as why, what, where, when, and how core mathematics is useful, important, or fundamental for a budding engineer to obtain the necessary professional abilities and competencies. At the end of the paper are presented some ideas related to applied mathematics vs. interdisciplinary mathematics in engineering.
Keywords: *applied mathematical modelling, interdisciplinary engineering problems, educational mathematics.*

Aprilie 2021

Sesiunea internațională studențească de comunicări științifice (CERC-2020) 23-24 aprilie 2021,

Dosan Vasile Laurentiu, Tomut Andrei Voicu, Cipu Elena Corina and Simion Emil, *The Ignorance in Quantum Cryptography*

Andronescu Valeria-Alina, Cipu Elena Corina and Bibic Simona Mihaela, *Modelling the Temperature Effect on Hybrid Systems*

STUDENTS' INTERNATIONAL
CONFERENCE CERC 2020
April 23-24, 2021

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ARTICLES

1. Andreoglou Marios and Chrysikos Nikolaos, *Deep Fakes: A Novel Weapon*, Helenic Air Force Academy, Dekeleia Air Force Base, Athens, Greece;
2. Anita Ionuț, Celik Aysun and Dirvareanu Marius, *Network Traffic Analyzer. Applications*, „Politehnica" University of Bucharest, Romania;
3. Cujbă Mihai, *Defense Techniques Against Cyber Attacks Aimed at Exfiltrating Data*, Military Technical Academy „Ferdinand I" of Bucharest, Romania;
4. Dosan Vasile Laurentiu, Tomut Andrei Voicu, Cipu Elena Corina and Simion Emil, *The Ignorance in Quantum Cryptography*, „Politehnica" University of Bucharest, Romania;

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2. Andronescu Valeria-Alina, Cipu Elena Corina and Bibic Simona Mihaela, *Modelling the Temperature Effect on Hybrid Systems*, „Politehnica" University of Bucharest, Romania;

Aprilie – Iunie 2021

Participare proiect INFOSYS, Cercetător științific III

Report on Format-preserving Encryption: the FF1 Scheme

Simona Bibic[a], Corina Cipu[a], Alexandru-Vlad Cristian[a], Alexandru Ioniță[b], Emil Simion[a], Antonela Toma[a], Ferucio Laurenţiu Ţiplea[b]

[a]*Faculty of Applied Sciences, Department of Applied Mathematics, Polytechnic University of Bucharest, Romania*
[b]*Department of Computer Science, Alexandru Ioan Cuza University of Iaşi, Romania*

Abstract
We summarize the recent results on the FF1, FF2, and FF3 schemes recommended by NIST for format-preserving encryption, in terms of recent vulnerabilities. We highlight that only FF1 still presents a viable solution for format-preserving encryption.

Due to some possible vulnerabilities recently highlighted on using the same irreducible polynomial in the AES cipher, we propose implementing the FF1 scheme in which the AES cipher is modified so that the key scheduling phase uses a different irreducible polynomial than the encryption /decryption phase.
This involves recalculating the tables on which the operations of the two phases of the cipher are based.
The implementation is double-checked on the conformity with the theoretical description of the FP1 scheme.

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Mai 2021

Sesiunea de comunicări științifice studențească (SCSS-2021) 5 mai 2021,

la Departamentul Matematici Aplicate (13-3)

- *Modelarea matematică a transferului de căldură*
  Studenți: Ioana-Miruna BULEANDRĂ, Iuliana NIȚĂ, anul I, Facultatea Energetică
- *Modelarea matematică a învăţării eficiente*
  Student: Pavel GHEORGHIȚĂ, anul I, Facultatea Energetică
- *Modelarea și eficientizarea folosirii unor energii regenerabile*
  Student: Maria PANICA, anul I, Facultatea Energetică
- *Modelarea efectului de temperatura in sisteme hibride*
  Student: Valeria ANDRONESCU, anul II, Facultatea Energetică
- *Rețelele neuronale: prieten sau dusman?*
  Student: Andrei- Robert CIULEI, anul III, Facultatea Științe Aplicate
- *Probleme bilocale rezolvate prin Metoda Elementului Frontieră*
  Student: Bianca-Maria CÎRNU, anul III, Facultatea Științe Aplicate
- *Ignoranță in Criptografie Cuantică*
  Student: Vasile-Laurenţiu DOSAN, anul III, Facultatea Științe Aplicate; Andrei-Voicu Tomuț, UBB Cluj
- *Integritatea bazelor de date și strategii de securizare*
  Student: Georgiana Nicoleta POPA, anul II, Master TCSI, Facultatea Științe Aplicate
- *Tehnici de folosire a testelor statistice prin calcul evolutiv*
  Student: Roxana-Ștefania OAJE, anul II, Master TCSI, Facultatea Științe Aplicate

Instruire curs Erasmus (ThinkBS 305)

Proiect: Erasmus+ **2019-1-TR01-KA203-077194** cu titlul "Promoting Deep and Wide Thinking / Early Dual Degrees in Basic Sciences"

Course title: **Innovative mathematical modeling techniques: fractional calculus, wavelet analysis, and estimating of nonlinearities**

Information about course: **This course is composed of three theoretical parts with applications that present: two sections which contain the notions of fractional calculus and wavelet analysis, as well as a section of methods for estimating nonlinearities**.

Estimating of nonlinearities
Some topics in this section that will be discussed: functions approximations by polynomial interpolation, iterative methods for calculating the eigenvalues and eigenvectors of a matrix, estimation methods of probability densities functions, estimation methods for solutions of nonlinear ODEs.

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Iulie-Septembrie 2021

Coordonare practică studențeasca

Studenți: **Bianca-Maria CÂRNU, Andrei-Robert CIULEI**

Tematica

- Prezentarea obiectivelor șia principiilor de bază ale companiilor.
- Înțelegerea scopului utilizării **limbajului deprogramare TeX.**
- Acomodarea cu software- ul ultilizat in vederea realizarii documentelor LaTeX (**TeXmaker, Miktex, Overleaf**).
- Introducere in limbajul de programare TeX. **Prezentarea comenzilor esentiale**: tipul documentului, structura unui document, pachete, macro definiții, așezarea in pagina ,formatarea textului,diacritice.
- **Organizarea detaliata a unui document LaTeX**: titlul documentului, autori,data, cuprinsul unui document, noțiunea de „abstract", etichete si referiri, note de subsol,anexe, bibliografie.
- **Realizarea unei prezentări în LaTeX**. Trecerea de la MicrosoftPowerPoint la **Beamer**.
- Pregătirea unor lucrări științifice in cadrul secției de cercetare: **Metoda Așteptării cu aplicații inRețele Neuronale** si **Soluții numerice pentru probleme bifocale**

Bibliografie:
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[5] Shortle J. F., Thompson J. M., Gross D., Harris C. M., *Fundamentals of Queueing Theory*. John Wiley & Sons, 2018, vol. 399.
[6] Charu C. Aggarwal, Neural Networks and Deep Learning, Editura Springer, 2018, ISBN 978-3-319-94462-3 ISBN 978-3-319-94463-0 (eBook), https://doi.org/10.1007/978-3-319-94463-0
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Noiembrie 2021

Participare conferinta 38th IBIMA Conference, Seville, Spain

Andrei-Robert CIULEI, Bianca-Maria CÂRNU, Elena-Corina CIPU, **Mathematical Modelling and Optimization of an Industrial Activity using a Queuing Model,** ISSN 2767-9640

**Center for Research and Training in Innovative Techniques
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38th IBIMA Conference: November 2021, Seville, Spain

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Mathematical Modelling and Optimization of an Economic Process using a Queuing Model

Andrei-Robert CIULEI, Bianca-Maria CÂRNU and Elena-Corina CIPU

38th IBIMA Conference:
November 2021, Seville,
Spain

▸ List of Accepted Papers

Abstract:

The paper presents general concepts from the queuing theory. Notations, hypotheses, and general relations for M (m, 1, s) mathematical model are given. Based on the settled mathematical model, the behaviour of some equipment with low failure rates is analysed in order to improve the dynamic process on the economic flow of a company. Based on the results of the models, the final conclusions are exemplified.

Noiembrie 2021

The 4nd edition of the Workshop on Innovative Techniques, Diversity & Connectivity, November 25, 2021 ;

Workshop Chair

Section Chair: Applied Mathematics in Information Technology
Participare workshop Secțiunea: Interdisciplinary mathematics in CiTi domains

Authors Vasile Laurentiu Dosan, Voicu Andrei Tomuț, Elena Corina Cipu,Emil Simion,

A novel approach for NIST spectral test using Quantum Fourier Transform

Authors Elena Corina Cipu, *Estimation Methods for Nonlinearities*

Coordonare lucrare:

Authors Andrei-Robert Ciulei, Bianca-Maria Carnu, **Association and classification problems in artificial neural networks**

Lucrari în curs de publicare

Emil SIMION, Elena-Corina CIPU, Vasile-Laurențiu DOSAN, Andrei-Voicu TOMUȚ
A note on the QFT randomness spectral test a new approach of DST, Cryptology ePrint Archive:
Report 2021/1625; https://eprint.iacr.org/2021/1625

Simona Mihaela Bibic, Elena Corina Cipu, Vlăduț-Alexandru Mielu, Bianca-Maria Cârnu, Andrei Robert Ciulei, **ÎNDRUMAR LATEX**, Editura Politehnica Press, ISBN* 978-606-515-992-1

Indrumare studenți Concursuri

Concursul Național Studențesc de Matematică "Traian Lalescu"

student **Pavel Gheorghiță** (Facultatea de Energetică, anul doi), **locul doi**

Realizare site centru CiTi pagina în limba română

http://citi.upb.ro/

Data: 20.12.2021

Cipu Elena Corina

Cipu Corina