HANOI UNIVERSITY OF SCIENCE AND TECHNOLOGY
Faculty of Mathematics and Informatics

SUBJECT REPORT

Introduction to Mathematics-Informatics

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Subject: Introduction to Mathematics-Informatics
Department: Faculty of Mathematics and Informatics

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INTRODUCTION

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Mathematics–Informatics is a universally applicable field of study, especially in the current Digital Technology era, Mathematics–Informatics is increasingly asserting its key role in all areas of life. This is a field of study that combines Mathematics – the

foundation of logic and analysis, with Informatics – a modern tool for processing and exploiting data, providing effective solutions to practical problems.

The Mathematics–Informatics training program provides students with knowledge of Informatics and Applied Mathematics, training students to think precisely about mathematics, algorithmic thinking and scientific approaches to solve problems arising from the fields of science, technology and life such as: security, communications, economics, finance, scientific calculation and simulation, industry, agriculture, irrigation, geology, construction, transportation, astronomy, educational science, entertainment, etc. Even today, even the "purest" fields of mathematics turn out to have practical applications.

"Without mathematics, there's nothing you can do. Everything around you is mathematics. Everything around you is numbers."

- Shakuntala Devi –

Based on the lectures and experience that teachers and seniors from companies, businesses, and alumni have taught and conveyed in the Introduction to Mathematics and Informatics class as well as information that the group has researched and collected from many sources, this report synthesizes the understanding of Mathematics and Informatics, the necessary knowledge and skills that students need to acquire and cultivate to achieve high results in the learning and training process as well as to thoroughly prepare for their future careers. In drafting the report, mistakes cannot be avoided, so we look forward to receiving comments, suggestions, and further guidance from you.

We would also like to thank the professors at the Faculty of Mathematics and Informatics as well as alumni who spent time teaching, talking and interacting, giving us useful lessons, as well as inspiring us to study, helping us to better understand the major we have chosen, and at the same time have a deeper insight at it. That is the steppingstone, the motivation for us to continue to try, to follow our pursuit.

CREDITS

Nguyen Hoang Long Dinh The Minh Pham Van Minh

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1.1 General information about Mathematics–Informatics

1.1.1 *General introduction*

Mathematics–Informatics is a major that trains knowledge and in–depth practical skills in informatics, mathematics, and applied mathematics to solve problems in financial mathematics, bioinformatics, applied statistics, big data management, security, and system safety, etc.

Mathematics is a part of human culture and is the foundation for natural and social sciences. In addition, Informatics is the key to success for everyone in the modern world. The application of mathematical methods enhances people's ability to think logically, deductively, and inductively. Using the achievements of Informatics helps people have outstanding computational abilities, especially in scientific and technological issues. Choosing the Applied Mathematics and Informatics major will help students be equipped with knowledge, skills, and professional thinking methods.

A prominent feature of our time is the widespread application of mathematical algorithms in all different areas of life, economics, finance, culture, science and technology, medicine, security, management, decision making and the establishment of complex systems, etc. For example, the generation of reliable codes for data transmission is based on the arithmetic of prime numbers. Efficient communication networks are designed based on the use of infinite–dimensional group representation theory. The smooth operation of telephone networks is due in no small part to the contribution of simplex algorithms to solve linear programming problems. Electronic money transaction systems, including the ATM system that we use every day, will not run without information security tools, the core of which is encryption algorithms. Modern CT scanners in the medical industry would not have been born without random transformations along with methods of solving equations with a substantial number of variables, etc. Mathematics and Informatics can be used in various technical, economic, and social fields.

It can be said that mathematics is the foundation of all fields of natural and social science research. Compared to other technical fields, the history of the invention and development of Informatics (IT) is still young. However, up to now, IT has been developing rapidly, surpassing other fields in terms of speed, products, application level and popularity for everyone in all fields. To meet the needs of building mathematical models for processing, storing, utilizing, and using data and information in various industries, to building computer programs to assist people in work, study, scientific research, etc., mathematics and informatics are indispensable tools.

Simply put, Mathematics and Informatics is the field of study to build computer programs to help solve practical problems that require high levels of mathematical models and algorithms. Mathematics in Mathematics–Informatics is therefore also mainly about the basic principles behind algorithms, how to process information, or use computers, software as tools to solve specific

computational problems, such as the subjects of calculus, algebra, discrete mathematics, computational complexity, data structures and algorithms, probability statistics, optimization, numerical methods, parallel computing and high-performance computing, etc. Mathematics–Informatics uses computers and computation to solve large problems such as privacy, security, health care, education, anti–poverty and climate change. All applications are based on computer platforms. Mathematics–Informatics is different from computer engineering or computer science in that it is the foundation for them. On the other hand, with the power of computers, it focuses on people or people-related problems. In short, we can define Mathematics–Informatics as an interdisciplinary field of study between Mathematics and Informatics, which is the field of study about research, development, application of mathematical and informatics methods; design, construction, administration, maintenance of application software in different fields: security, calculation, communication, economics, finance, business administration, science, education, industry, entertainment, irrigation, etc. Therefore, choosing Applied Mathematics–Informatics will help students be equipped with knowledge, skills, and professional thinking methods.

1.1.2 *General knowledge*

Basic knowledge of Mathematics includes Analysis, statistical inference, optimization, calculation methods, statistical probability, discrete mathematics, optimization of combinations of soft computing methods, approximate reasoning, modeling, simulation, etc. This knowledge is the foundation for you to be able to build tools to analyze the current situation, identify potential problems, risks and opportunities, predictive analysis tools, evaluate future scenarios, risk management, optimization tools to choose the best solution to ensure minimizing losses as well as maximizing value and profits.

Basic knowledge of Informatics includes data structures and algorithms, algorithm analysis, complexity, programming languages, programming techniques, information security and safety platforms, computer networks, databases, software engineering, information system analysis and design, etc. This knowledge is the foundation for anyone to be able to build, develop, install, run, and maintain software, programs, and computer systems.

Update technology in the field of information and communication includes expert systems, knowledge management, artificial intelligence, machine learning, machine vision, natural language processing, deep learning neural networks, evolutionary computing, high performance computing, cloud computing, parallel processing, distributed processing, deductive databases, data warehouses, decision support systems, blockchains, smart contracts, office automation, applications programming.

Knowledge of management and economics based on modern technology includes e–commerce, e–marketing, social network data mining, business intelligence, supply chain management, customer relationship management, enterprise resource planning, human resource management, business process management, performance management, project management, etc.

1.1.3 *Skills that can be achieved after graduation*

- Ability to describe, calculate and simulate the management of systems, technological processes, and build application software.
- Ability to research, analyze and provide solutions to several problems in Engineering, Industry, Economics, Finance, such as optimization problems, forecasting, analysis, statistics, decision support, etc.
- Ability to set up the theoretical basis of the problem, mathematical modeling, and find ways to solve problems in diverse and ever–changing fields of scientific reality and economic and social life.

1.1.4 *Job opportunities*

- Research and development (R&D) specialist, software specialist at IT companies, postal, telecommunications, e–commerce, technology corporations, etc.
- Informatics specialist at enterprises, factories, financial companies, insurance, banks, state administrative agencies, etc.
- Informatics or mathematics lecturer at colleges and universities; – Researcher in Mathematics and Informatics.
- Statistics, analysis, forecasting, risk management, investment appraisal specialist at banks, financial companies, insurance, enterprises, etc.
- Applied mathematics specialist in transportation, telecommunications, irrigation, agriculture, industry, healthcare, etc.

1.2 Mathematics and Informatics at Hanoi University of Science and Technology

1.2.1 *Introduction to the Institute of Applied Mathematics and Informatics*

The predecessor of the Institute of Applied Mathematics and Informatics at Hanoi University of Science and Technology was the Mathematics Department, established in 1956, with the task of teaching Mathematics to students of the whole school, then the Faculty of Mathematics and Physics (since 1968) and started training in the major (at that time called Engineering Mathematics) according to the proposal of Professor Tran Dai Nghia and Professor Ta Quang Buu. Today, the Institute's staff consists of more than 70 staff, most of whom have received PhD training in developed countries, have professional qualifications and are enthusiastic about their work. The Institute has cooperative relationships with many faculties and institutes at prestigious universities in and outside the country. With the desire to train closely with practice and create many job opportunities for students, the Institute always supports and promotes good cooperative relationships with enterprises, corporations, and research institutes such as Viettel, CMC, VPBank, VietinAviva Insurance, Institute of Mathematics, Institute for Advanced Study in Mathematics, etc. Many students with good academic results have been sponsored or selected by enterprises during their studies.

Currently, the Institute of Applied Mathematics and Informatics, Hanoi University of Science and Technology, is a prestigious research and training unit for undergraduate and postgraduate students in Mathematics and Informatics. The Institute's main tasks are:

- Teaching and researching mathematics, applied mathematics and informatics.
- Conducting research and teaching cooperation with domestic and foreign training institutions.
- Coordinate with sectors, levels, and enterprises in applying mathematics and informatics in fields such as economics, finance, construction, engineering, etc.

In addition to teaching mathematics to students at the whole school every year, the Institute also trains Bachelor of Engineering, engineers in Mathematics and Informatics, Management Information Systems and talented Mathematics and Informatics engineers. After graduation, students at the Institute quickly find jobs at banks, financial analysis centers, statistical auditing agencies, informatics companies, the General Statistics Office, the State Planning Commission, universities, research facilities, etc. According to many employers, students at the Institute have many advantages because they are equipped with a good foundation in mathematics and computational science, along with sharp thinking ability, high self–study ability, so they can easily grasp and adapt to the working environment that requires continuous updating. Most of the Institute's alumni have a high and stable income. Many of them have become key members of their work units. In addition, graduates also have many opportunities to study postgraduate abroad.

1.2.2 *Major in Mathematics and Informatics at Hanoi University of Science and Technology*

The major in Applied Mathematics and Informatics in the Applied Mathematics department trains Bachelor of Science with in–depth knowledge of Applied Mathematics and Informatics and the ability to apply mathematical models to solve practical problems. Mathematical models are one of the keys to researching financial markets, assessing risks in banks, insurance corporations and large systems that help predict the world around them, predict natural and environmental phenomena. The undergraduate and engineering training program in Mathematics and Informatics of the Institute of Applied Mathematics and Informatics is designed with the main purpose of equipping students with basic and in–depth knowledge of mathematics, applied mathematics and computer science to be able to coordinate with other scientific fields in applying mathematics to many practical fields such as economics, finance, science and technology and life, etc.

The Institute's training program is regularly updated to keep up with the development needs and labor trends of society. During their studies at the Institute, students can become familiar with scientific research from the second

year under the dedicated guidance of teachers within the framework of a project, a topic at the state, ministry, school level, etc. in the form of student scientific research topics, graduation projects and can even participate as members in the Institute's research topics. Thereby, students can cultivate the ability to think creatively and independently, work in multidisciplinary teams, and adapt well to the continuous changes and innovations of science and technology. Not only taking part in reporting at the Student Scientific Research Conference held annually at the school, students at the Institute of Applied Mathematics and Informatics are also sponsored to take part in domestic scientific conferences and international scientific conferences held in Vietnam. Some students have co–authored with teachers on articles published in the Proceedings of Conferences and prestigious Mathematics Journals. In addition, extracurricular activities such as arts, sports, volunteering, exchanges, soft skills training, etc. regularly organized by the Union have also brought many practical benefits, helping students have useful experiences, be more interested in studying and be more confident in life.

Each course, the Institute trains about 100 students in the Mathematics and Informatics major and 10–20 talented Mathematics and Informatics engineering students. After graduation, the Institute's students quickly find jobs at banks, financial analysis centers, statistical auditing agencies, informatics companies, the General Statistics Office, the State Planning Commission, universities, research facilities, etc. According to many employers, Mathematics and Informatics engineers have a distinct advantage over other majors because they are equipped with a good foundation in mathematics and computational science, along with sharp thinking ability and high self–study ability, so they can easily grasp and adapt to the working environment that requires constant updating. In addition, graduates also have many opportunities to study postgraduate abroad. Most of the Institute's alumni have quite high and stable incomes. Many of them have become key members of their work units. In the strong impact of the trend towards information society and knowledge economy, there are many opportunities and many challenges waiting for the Institute of Applied Mathematics and Informatics. With the experience and continuous efforts of generations of staff and students, the Institute of Applied Mathematics and Informatics can certainly take advantage of opportunities, overcome challenges to become the leading unit in Vietnam in training high–quality human resources in the field of Mathematics and Informatics.

1.2.3 *Training program of Mathematics and Informatics at Hanoi University of Science and Technology.*

The training program of Mathematics and Informatics directs students to the correct way of thinking of mathematics, algorithmic thinking, scientific approaches to problems arising from reality as well as the ability to quickly adapt to the development of science and technology. The program structures, knowledge, and skills provided:

- Training time according to design: 4 years (8 main semesters). According to the training regulations, to complete the program, students can shorten the maximum of 3 semesters or extend the maximum of 5 semesters.
- Total knowledge volume of the course: 132 credits.
- English requirements: Students with a TOEIC score of 250 or more are exempted from Pre–TOEIC English, from 300 are exempted from TOEIC English 1. Before taking the DTN, students must achieve 650 TOEIC.
- Physical Education and Military Education subjects: have separate certificates, not considered in the total knowledge volume for a training major and in calculating the average score of students. Study time and content according to the general regulations of the Ministry of Education and Training.

Course list & Standard schedule

#	Course ID	Course Title	Credit
Social sciences and Humanities			12
1	SSH1110	Những NLCB của CN Mác-Lenin I	2(2-1-0-4)
2	SSH1120	Những NLCB của CN Mác-Lenin II	3(2-1-0-6)
3	SSH1050	Tư tưởng Hồ Chí Minh	2(2-0-0-4)
4	SSH1130	Đường lối CM của Đảng CSVN	3(2-1-0-6)
5	EM1170	Pháp luật đại cương	2(2-0-0-4)
Physical Education			5
6	PE1014	Theory in Sport	1(0-0-2-0)
7	PE1024	Swimming	1(0-0-2-0)
8	Elective	Elective course 1	1(0-0-2-0)
9	Elective	Elective course 2	1(0-0-2-0)
10	Elective	Elective course 3	1(0-0-2-0)
Defense and security education			10
11	MIL1110	Đường lối quân sự Đảng	0(3-0-0-6)
12	MIL1120	Công tác quốc phòng, an ninh	0(3-0-0-6)

13	MIL1130	QS chung và chiến thuật, kỹ thuật bắn súng tiểu liên AK(CKC)	0(3-0-2-8)
English			6
14	FL1100	Tiếng Anh I	3(0-6-0-6)
15	FL1101	Tiếng Anh II	3(0-6-0-6)
Math and Fundamental Science			33
16	MI1111	Giải tích 1	4(3-2-0-8)
17	MI1121	Giải tích II	3(2-2-0-6)
18	MI1131	Giải tích III	3(2-2-0-8)
19	MI1141	Đại số	4(3-2-0-8)
20	MI3030	Xác xuất thống kê	4(3-2-0-8)
21	PH1110	Vật lí đại cương I	3(2-1-1-6)
22	PH1120	Vật lí đại cương II	3(2-1-1-6)
23	IT1110	Tin học đại cương	4(3-1-1-8)
24	MI3010	Toán rời rạc	3(3-1-0-6)
25	MI3041	Giải tích số	2(2-1-0-4)
Major core courses			47
26	MI2000	Nhập môn Toán Tin	3(2-0-2-6)
27	MI2150	Đại số đại cương	2(2-1-0-4)
28	MI2060	Cơ sở giải tích hàm	3(3-1-0-6)
29	MI3060	Cấu trúc dữ liệu và giải thuật	3(3-1-0-6)
30	MI3090	Cơ sở dữ liệu	3(3-1-0-6)
31	MI3310	Kỹ thuật lập trình	2(2-0-1-4)
32	MI3380	Đồ án I	3(0-0-6-6)
33	MI3370	Hệ điều hành	2(2-1-0-4)

34	MI3120	Phân tích và thiết kế hệ thống	3(2-2-0-6)
35	MI4060	Hệ thống và mạng máy tính	3(2-1-1-6)
36	MI3390	Đồ án II	3(0-0-6-6)
37	MI3050	Các phương pháp tối ưu	4(4-1-0-8)
38	MI3070	Phương trình đạo hàm riêng	3(3-1-0-6)
39	MI4090	Lập trình hướng đối tượng	3(2-2-0-6)
40	MI3080	Giải tích phức và ứng dụng	3(3-1-0-6)
41	MI3342	Kiến trúc máy tính	2(2-1-0-4)
42	MI3042	Phương pháp số	2(2-1-0-4)
Soft skills			9
43	EM1010	Quản trị học đại cương	2(2-1-0-4)
44	EM1180	Văn hóa kinh doanh và tinh thần khởi nghiệp	2(2-1-0-4)
45	ED3280	Tâm lý học ứng dụng	2(1-2-0-4)
46	ED3220	Kỹ năng mềm	2(1-2-0-4)
47	MI2030	Technical Writing and Presentation	3(2-2-0-6)
Elective course			16
Module 1: Tính toán và hệ thống phần mềm			
48	MI4414	Quản trị dự án CNTT	2(2-1-0-4)
49	MI4314	Tối ưu tổ hợp	2(2-1-0-4)
50	MI4100	Mật mã và độ phức tạp thuật toán	3(3-1-0-6)
51	MI4364	Tính toán song song	2(2-1-0-4)
52	MI4374	Thiết kế, cài đặt và quản trị mạng	2(2-0-1-4)
53	MI4382	Đồ họa máy tính	3(3-1-0-6)
54	MI4214	Kho dữ liệu và kinh doanh thông minh	2(2-1-0-4)

Module 2: Xử lí dữ liệu thông minh			
55	MI4024	Phân tích số liệu	2(2-1-0-4)
56	MI4304	Hệ thống phân tán	2(2-1-0-4)
57	MI4050	Chuỗi thời gian	3(3-1-0-6)
58	MI4100	Mật mã và độ phức tạp thuật toán	3(3-1-0-6)
59	MI4216	Hệ hỗ trợ quyết định	2(2-1-0-4)
60	MI4214	Kho dữ liệu và kinh doanh thông minh	2(2-1-0-4)
61	MI4364	Tính toán song song	2(2-1-0-4)
Module 3: Tính toán khoa học			
62	MI4024	Phân tích số liệu	2(2-1-0-4)
63	MI4162	Lập trình tính toán	2(2-0-1-4)
64	MI4314	Tối ưu tổ hợp	2(2-1-0-4)
65	MI4364	Tính toán song song	2(2-1-0-4)
66	MI4034	Mô hình toán kinh tế	2(2-1-0-4)
67	MI4084	Phương pháp sai phân và phần tử hữu hạn	3(3-1-0-6)
68	MI4050	Chuỗi thời gian	3(3-1-0-6)
Module 4: Toán ứng dụng trong kinh tế và công nghiệp			
69	MI4043	Mô hình toán kinh tế	2(2-1-0-4)
70	MI4341	Một số phương pháp toán học trong tài chính	3(3-1-0-6)
71	MI4141	Mô phỏng ngẫu nhiên và ứng dụng	2(2-1-0-4)
72	MI4314	Tối ưu tổ hợp	2(2-1-0-4)
73	MI4024	Phân tích số liệu	2(2-1-0-4)
74	MI4024	Lập trình tính toán	2(2-0-1-4)
75	MI4084	Phương pháp sai phân và phần tử hữu hạn	3(3-1-0-6)

Engineering Internship and Bachelor Thesis			8
76	MI4800	Thực tập kỹ thuật	2(0-0-4-4)
77	MI4900	Đồ án tốt nghiệp cử nhân	6(0-0-12-12)

1.2.4 *Program Learning Outcomes*

After graduation, a Bachelor of Mathematics and Informatics from Hanoi University of Science and Technology must have:

- Basic and specialized knowledge of Mathematics, Applied Mathematics, and Informatics to meet the specific tasks of the Mathematics and Informatics interdisciplinary field and related fields:
  - Ability to apply knowledge of Mathematics, Informatics, and basic sciences to describe, calculate and simulate the management of systems, technological processes, and build application software.
  - Ability to apply basic and specialized knowledge of Mathematics and Informatics to research, analyze and provide solutions to many problems in Engineering, Industry, Economics, Finance, etc.
  - Ability to set up the theoretical basis of the problem, model Mathematics, and find ways to solve problems in diverse and ever–changing fields of scientific reality and socio–economic life.
- Professional skills and qualities required to be successful in a career:
  - Ability to think analytically, design and build computing systems, management information as well as application software programs to solve problems in Mathematics and Informatics arising in practice.
  - Ability to experiment, research and explore knowledge.
  - Systemic thinking and critical thinking.
  - Dynamic, creative and serious.
  - Ability to adjust and adapt to many different application fields and adapt to the development of computational science and technology.
  - Ethics and professional responsibility.
  - Understanding of contemporary issues and awareness of lifelong learning.
- Social skills needed to work effectively in multidisciplinary teams and in an international environment:
  - Organizational, leadership and teamwork skills (multidisciplinary and international).
  - Effective communication skills, writing skills, presentation, discussion, negotiation, situation control, effective use of modern tools and means.
  - Effective English skills at work (TOEIC score $\geq$ 450).
  - Ability to integrate, have the will to improve and the ability to self–improve academic qualifications and professional skills.

- Ability to think analytically, design, build, develop projects and products applying Mathematics and Informatics:
    - Ability to build and develop projects, systems, solutions, products applying Mathematics and Informatics according to the practical needs of scientific – technical problems, Economics, Finance, Management, etc.
    - Ability to teach and research Applied Mathematics and Informatics in universities, colleges, research institutes.
    - Ability to continue postgraduate studies (master's and PhD) in Mathematics, Mathematics–Informatics and Informatics, Economics, and some other sciences.
- Good political qualities and sense of serving the people, good health, meeting the requirements of building and defending the Fatherland:
    - Have political theory level according to the general program prescribed by the Ministry of Education and Training.
    - Have a Physical Education certificate and a Defense and security education certificate according to the general program prescribed by the Ministry of Education and Training.

TOPIC 2. NECESSARY KNOWLEDGE AND SKILLS

2.1 Study methods at university

- **Learn about the training program of your major or department**

For freshmen, they should learn about the training program of their major or department (go to the website of the department, ask teachers, or consult seniors) to plan a general study plan for the entire learning process. Before registering for courses in each semester, students need to clearly find what they will study and their financial ability in that semester to register for right courses. In addition, clearly find the skills and knowledge that need to be supplemented, the need for soft skills, foreign languages, and computer skills related to the major being studied, from their plan to practice all those skills in which semester.

- **Study hard and listen carefully**

We should study hard and listen carefully to our teachers. These things are very useful for students:

- Attendance is highly appreciated.
- Help students shorten the review time later.
- Do exercises faster and easier.
- Don't be surprised when re–reading the study outline. • Grasp the key points of the lesson.
- Studying hard will create a good habit, helping us to be confident and excited when going to school. Along with teaching, students must note:
- Do not skip or take lightly the first time of the lesson.
- Focus on following the lecture, in general, do not think about what to do because that will break the logic of the lecture listening process.
- Focus on listening, understanding the problem and then taking notes according to your understanding. Pay attention to writing the outline to see the general structure of the lecture, pay attention to the focus and key points of the problem.
- Focus on the main content, the most important points that the lecturer often emphasizes through intonation, through repetition.
- Pay attention to the summaries, diagrams and other visual materials introduced by the lecturer, because this is the time for the teacher to systematize, compare, analyze, etc. to grasp the sequence of progress to conclusions and draw new ones.
- When freshmen meet difficult or unclear points, temporarily put them aside and try to learn them later so that the listening process is not interrupted.
- When the lecture stops, students can ask questions to deepen their knowledge, relate to practice and clarify areas that they do not understand.

- Students should spend a few minutes skimming through the materials they will study before listening to the lecture. Knowing the difficult issues will remind them to pay more attention when listening to the lecture. (Note: Previewing cannot replace listening to the lecture).
    - **Mark the key areas of the lesson**

Always carry a pencil or colored pen while studying. Scholars can use it to mark the formulas, key knowledge in the lesson that the teacher emphasizes or the parts that are difficult to understand. Then write it down in a notebook or in their own memory. For the places they still have questions about, feel free to discuss with friends or ask the subject teachers directly. Be bold and actively learn by learning from teachers and friends, learning online, through reference books, etc. Knowing how to select knowledge from many diverse sources and synthesize them is a smart and scientific way to get knowledge, convenient for future review.

- **Create excitement and comfort in learning**

The future is in your hands, and you are the one who decides the future. Do not be constrained, force yourself into a narrow framework, create pressure for yourself. Be comfortable in learning. Each person should set a specific goal – a goal that you really wish for and enjoy. That is a great motivation for you to strive. Combine studying and relaxing. However, we should not use social networks or play games too much because it can easily lead to "game addiction" and neglect studying. Maintain a regular lifestyle, do not stay up too late, do not wake up too early, eat properly. During self–study time, you should concentrate for about 30 minutes, then sit down and relax for 5 minutes and continue studying.

2.2 Necessary skills for Mathematics–Informatics students

Mathematics–Informatics is a field related to applying mathematical concepts and theorems to computers and informatics. Mathematics majors in the industry often apply mathematical methods, theories and algorithms to solve practical problems related to computers and informatics, including computer programming, software design and development, network communications, information security, artificial intelligence, machine learning and many other fields. With the informatics market lacking a lot of high–quality human resources but having an excess of low–quality human resources, one equipped with knowledge of mathematics can solve difficult problems in informatics. That is why employers need human resources from the Mathematics–Informatics major of Hanoi University of Science and Technology and other schools in general to solve many problems in many fields.

2.2.1 *Problem–solving skills*

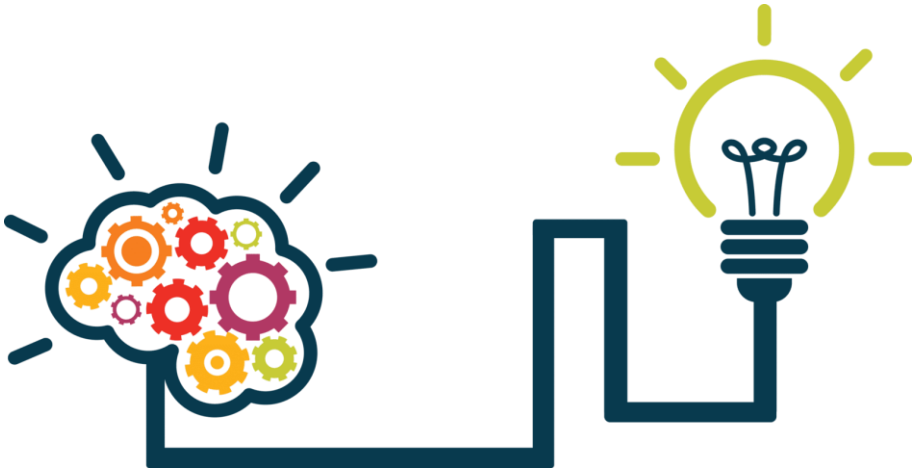


Figure 2.1

In all fields, the ability to solve problems and situations is needed. Fields related to informatics are increasingly appreciated and need to be resolved neatly and quickly. Experts in Mathematics–Informatics can apply mathematical ability to projects related to Software Development (software development), System Design (system design), etc.

2.2.2 *Understanding of algorithms*

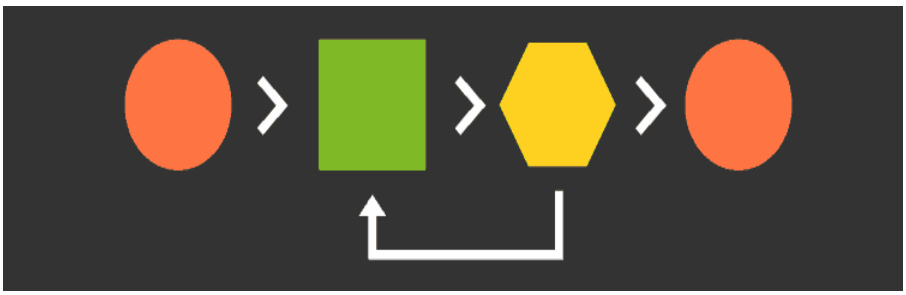


Figure 2.2

Applied algorithms to design and deploy innovative technology applications, it is necessary to have in–depth knowledge of algorithms and theory of algorithm complexity. Moreover, Mathematics–Informatics students are equipped with a lot of knowledge of mathematics from which to build best algorithms, especially in the field of Applied Mathematics.

2.2.3 *Programming skills*

Figure 2.3

As a major that is extremely developing and extremely competitive. Mathematics–Informatics is also a field that needs quite high programming ability. Mathematics experts need programming techniques to be able to deploy their algorithms into computers to solve problems in the informatics industry.

2.2.4 *Knowledge of artificial intelligence and data science*

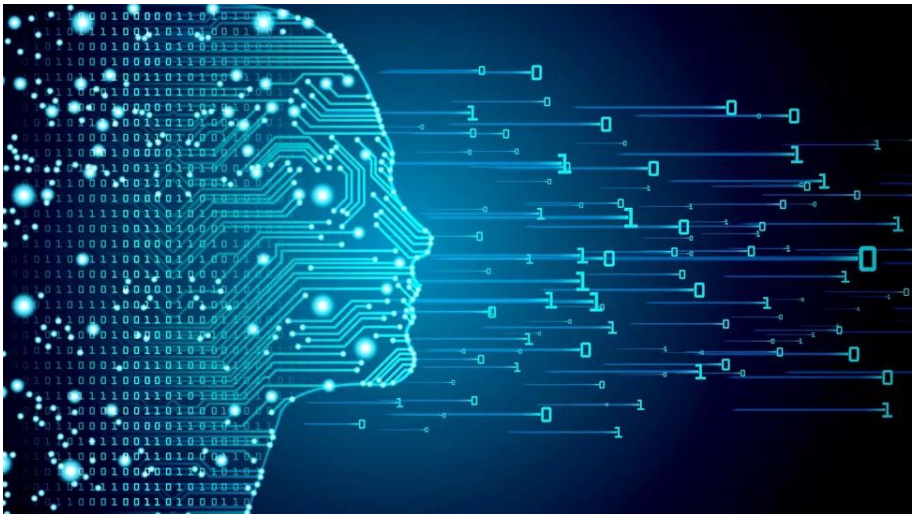


Figure 2.4

Data science and artificial intelligence are becoming increasingly important fields in informatics. Math – IT professionals need in–depth knowledge of these fields to develop effective informatics solutions. Just looking at the field of artificial intelligence, we have many outstanding examples such as Apple's Siri, OpenAI's Chat GPT, etc.

With such requirements, companies, and businesses in the job market recruit experts in the field of Mathematics–Informatics for positions such as:

- Research and development specialist (R&D), software specialist, etc.
- Statistical analysis specialist, forecasting, risk management, investment appraisal, etc.
- Informatics specialist at enterprises, financial companies, etc.

- Applied mathematics specialist in many areas of life such as: Telecommunications, transportation, agriculture, industry, medicine, etc.
- Participating in teaching and researching Mathematics–Informatics at training institutions and research institutes.

2.3 Teamwork – an indispensable skill in the 4.0 era

2.3.1 *Teamwork skills*

Figure 2.5

Today, almost any profession requires the ability to work in a team. Even with independent jobs (e.g., IT, accounting, etc.), you will still need to be aware of your role in the larger goals of the business, as well as know how to communicate your achievements to other members of the organization. Necessary teamwork skills include communication skills – conflict resolution – organizing meetings.

2.3.2 *Communication skills*

Communication is the act or process of exchanging information, ideas, and emotions between people to achieve certain goals. Communication skills include listening, questioning, persuading, respecting, helping, sharing, working together.

2.3.3 *Conflict resolution skills*

- Recognizing conflict, considering it a problem that needs to be solved, clearly finding the details of the conflict, not attributing, labeling, or denouncing.
- People listen to each other, willing to change their own views, and discover differences between the two sides, cooperate and build for a common goal.
- Learn about the circumstances and conditions of the person in conflict with you to understand their point of view
- Try to gradually move towards an agreement between the two sides.

2.3.4 *Meeting organization skills*

- Meeting preparation

- Starting the meeting
- Bringing up and analyzing each topic
- Making an action plan
- Closing the meeting

2.3.5 *Some tools for running group meetings*

- Brainstorming techniques
- Using problem/solution trees
- Using mind maps
- Using logical frameworks
- Using the fishbowl technique

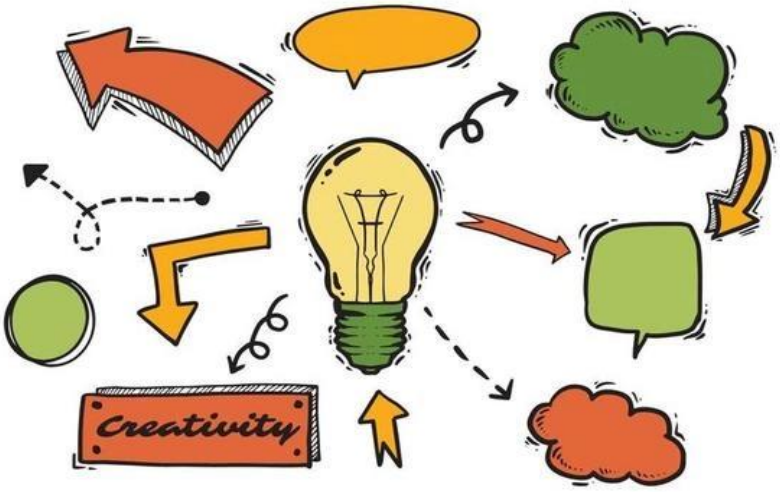


Figure 2.6

2.4 Sharing from some businesses and alumni

2.4.1 *Identify Ikigai (FPT Software)*

Ikigai (Japanese noun): Every morning when you wake up, you know what you are living for!

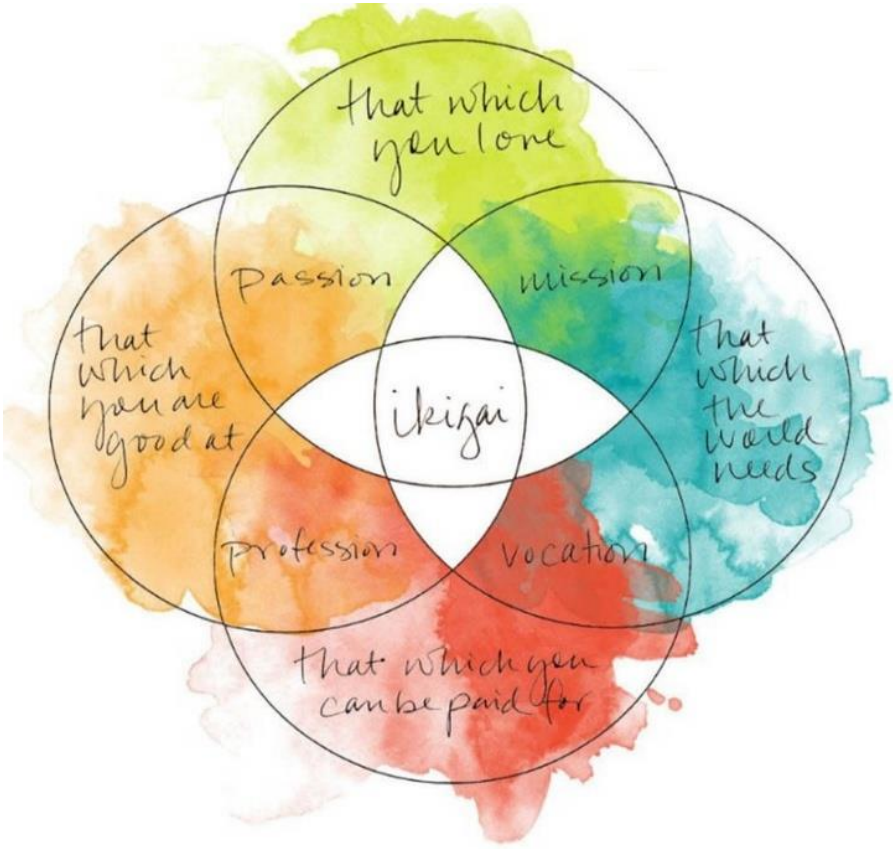


Figure 2.7

2.4.2 *Set goals with OKR (FPT Software)*

- O: Objective
- KR: Key Results

Figure 2.8

OBJECTIVES + KEY RESULTS

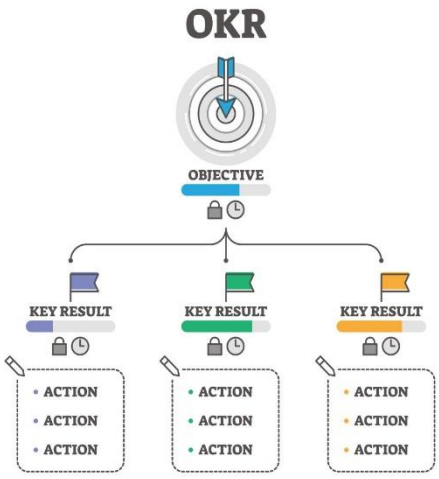


Figure 2.9

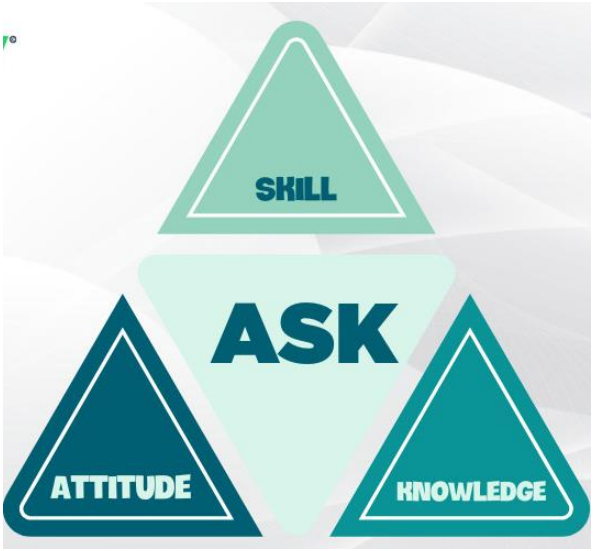
Each Objective (O) must have a set of 3–5 Key Results (KR).

- If you achieve all KR, it means that you have achieved the objective (O).
- Vice versa, achieving the Objective means that you have achieved the key results.

Set goals according to the S.M.A.R.T principle

2.4.3 *ASK model (FPT Software)*

The ASK model, including Attitude, Skill, and Knowledge, is one of the most used models today to evaluate employee capacity. There are three main factors: attitude, knowledge, and skills.



2.5 How to write a CV (Job Handbook – Mentor Ngoc Nguyen)

2.5.1 *General principles*

To write a "standard" CV right from the first time, thoroughly apply the following 5 general principles:

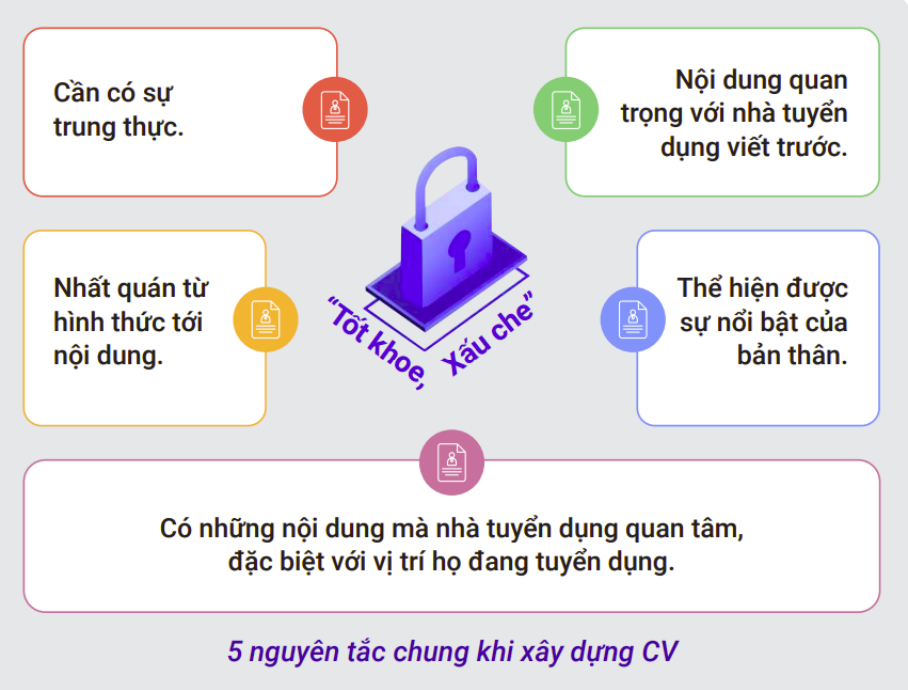


Figure 2.10

" Do good for others": You should emphasize outstanding achievements and skills, creating a strong impression on the employer. Weaknesses or unrelated experiences should be handled skillfully, minimized attention, or omitted if necessary. But you still need to be honest when writing a CV. The goal is that the CV needs to stand out from other candidates, showing its suitability to the portrait they are looking for.

2.5.2 *Instruction for choosing a CV template*

To write a good CV, you need to clearly understand how employers review CVs. Normally, at the CV Screen step, HR specialists will spend 6s – 10s to review the CV, so CVs with presentation errors such as: incorrect layout, sloppy presentation, too flashy colors, etc. will be at once eliminated.

Figure 2.11

There is no specific standard for CV templates, but each profession has its own characteristics, whether it is a candidate or an employer. Choosing a style that is suitable for the industry will prove knowledge, create the "aura" of the CV, and reflect who you are.

Figure 2.12

For the technical and IT groups: Candidates and employers often prefer simplicity and clarity, focusing more on content, so the CV will also be designed in that style. Project companies, contractors for third parties such as construction

companies, interior design companies, IT companies, NTD are often interested in the projects you have done, so you need to choose a CV template that allows you to present the project

2.5.3 *How to build CV content*

Figure 2.13

Figure 2.14

2.5.4 *Basic mistakes when writing CV*

- CV information is sketchy, mainly personal information. Cannot present other items or do not know how to present more.
- Describe social activities that are not relevant to the job posting.
- Spelling, letter spacing, letter jumping.
- Flashy presentation, not showing professionalism
- Too much detail in job descriptions.

2.5.5 *Professional CV creation tool*

Choosing the right CV builder will help you design a professional and impressive profile. There are many online tools with a variety of CV templates that are easy to customize, saving you time and ensuring a clear layout. Here are some tools you can refer to:

Figure 2.15

Figure 2.16

REFERENCES

[1] Introduction to Mathematics and Informatics – MI2001 – HUST Studocu

[2] Introduction to Mathematics and Informatics K66 Report

[3] Job Handbook Mentor Ngoc Nguyen

[4] PowerPoint Presentation FPT Software, Viettel

[5] Information on https://fami.hust.edu.vn/ and some other sources

APPENDIX

A1. Shakuntala Devi

Shakuntala Devi (November 4, 1929 – April 21, 2013) was an Indian mental calculator, astrologer, and writer, popularly known as the "Human Computer". Her talent earned her a place in the 1982 edition of The Guinness Book of World Records. However, the certificate for the record was given posthumously on 30 July 2020, despite Devi achieving her world record on 18 June 1980 at Imperial College, London. Devi was a precocious child, and she proved her arithmetic abilities at the University of Mysuru (Mysore) without any formal education.

Devi strove to simplify numerical calculations for students. She authored several books in her later years, including novels as well as texts about mathematics, puzzles, and astrology. She authored the book The World of Homosexuals, which is considered the first study of homosexuality in India. She saw homosexuality in a positive light and is considered a pioneer in the field.

A2. FPT Software

FPT Software Company Limited (Vietnamese: FPT Software Limited Company), also known simply as Fsoft is a global IT services provider headquartered in Hanoi, Vietnam, being the core subsidiary of the FPT Corporation. It is considered one of the biggest software services companies in Vietnam, with US$1.87 billion (about $5.8 per person in the US) in revenue (FY2022) and more than 48,000 core employees.

A3. MENTOR: NGOC NGUYEN

JobOKO Career Counseling Network Member, Handbook Editor Consultant. This handbook is compiled with passion, along with a lot of knowledge distilled from real life. She believes that “Every person is born with a

mission and has all the elements to become a successful person. It is important that you UNDERSTAND YOURSELF”