OBJECTIVE 2 – QUALIFICATION BENCHMARKING

Bachelor of Management Information Systems (MIS), Vietnam National University (VNU)
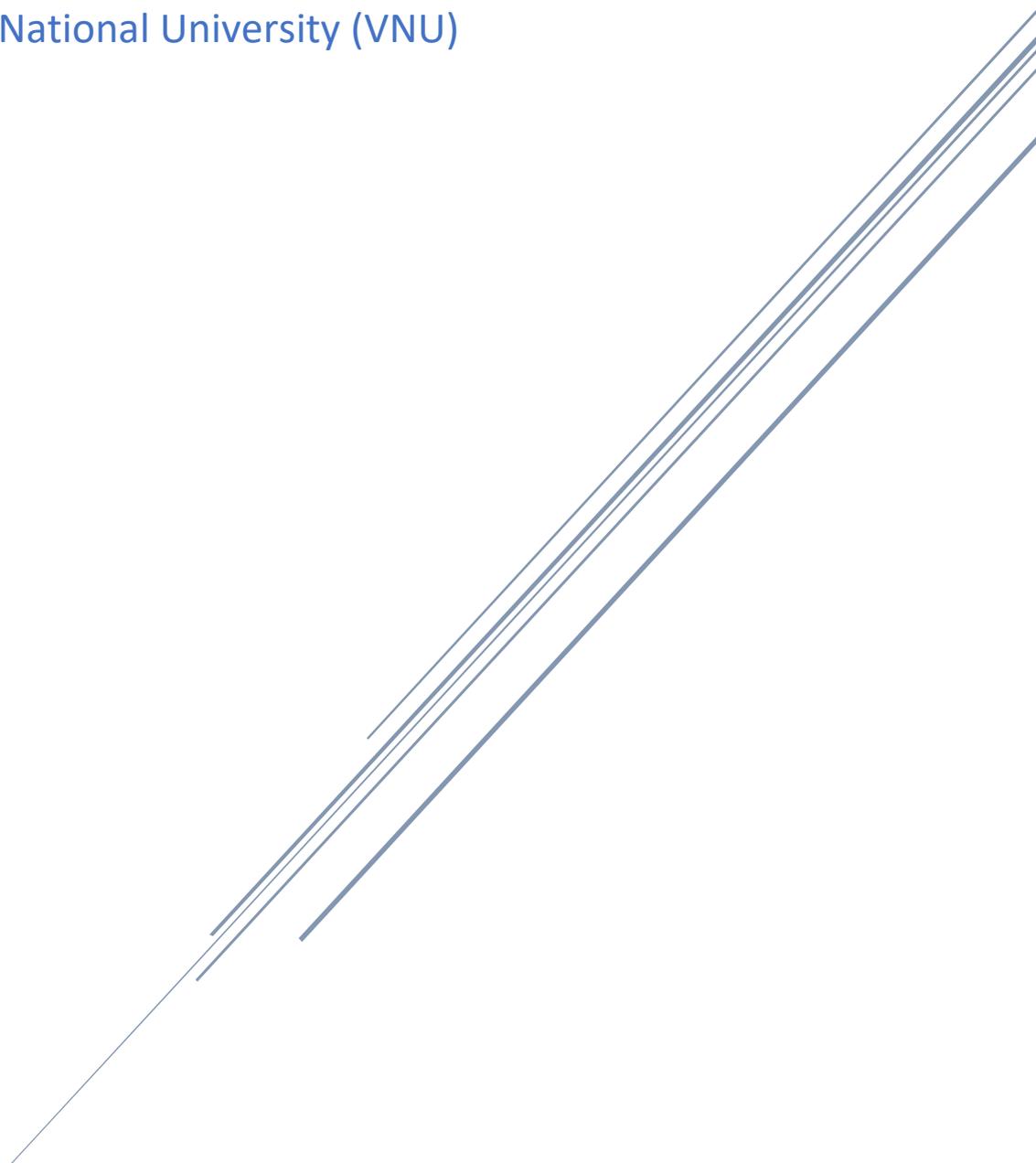
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Introduction

The Bachelor of Management Information Systems (MIS) at Viet Nam National University provides a wide range of concepts and applications of information systems for business and industries. This is a specialised programme and for this benchmarking exercise we focus only on modules/courses related to Information Systems (not finance, business or marketing).

For this benchmarking exercise we have developed a scoring matrix where we identified 5 themes (programming, knowledge management, knowledge abstraction, knowledge representation/communication and research/soft skill). **Programming** theme entails criteria related to design and development of not only software but also other artefacts like algorithms, network, IoT framework etc. The theme also includes the evaluation process and collaborative management of the artefacts. **Knowledge management** primarily focuses on processes and techniques of warehousing different types of data. The theme also includes security and privacy issues related to data management. **Knowledge abstraction** theme focuses on different data analytics and machine learning techniques applied to different types of data. **Knowledge representation/communication** theme includes different visualisation techniques used to represent the results (from database query through to data analytics to algorithm) to a wide range of stakeholders. **Research/Soft skills** theme focuses on the understanding and practice of research methods along with the ability to undertake team work and present results to wider audience.

Within each theme, we have a set list of criteria against which each course is scored. The score is within the range of 50 – 100. 90 – 100 (fully meets the criteria); 75 – 89 (mostly meets the criteria); 60 – 74 (partially meets the criteria); 50 – 59 (barely meets the criteria). The marks are indeed subjective and therefore debatable. However, the pattern that emerges as result of the scoring of each module/course provides a holistic view of the programme and clearly identifies the areas of strengths and improvements.

Design of the programme

1. This 145 credit programme focuses on a wide range of applied areas where information management is required.

2. This 145 credit programme has four specialisation pathways – information systems management with focus on (i) AI, database and network, (ii) finance, (iii) marketing and (iv) real estate.

3. The programme starts with general knowledge (21 credits) that covers philosophy, politics and history of communist party followed by learning of English language.

4. Field-based knowledge (25 credits) introduces students to basic concepts of information systems, mathematics, statistics, programming as well as psychology.

5. Area-based knowledge (8 credits) focuses on law and economics(* relevance of these area to MIS was not clear).

6. The discipline-based knowledge (26 credits) courses provide advanced knowledge of AI, database, network and IP issues

7. Upon development of the foundational knowledge and skill sets, the programme then focuses on specialised knowledge (65 credits) with 40 different courses on offer. For

specialisation, students need to take 9 compulsory and 2 elective courses first, that enhance their understanding of AI, database etc. along with entrepreneurship. Upon completion of these courses, students choose 5 in-depth knowledge courses to establish their specialisation pathway.

8. The programme completes with an internship and graduate project that provide real-life and research experience respectively.

Mode of Delivery

9. All courses are delivered in English and have theory, practice and self-study credit hours. From the course structure document, it is evident that only the internship and graduate project courses have allocated self-study hours.

10. The programme has a multidisciplinary approach with a wide range of subjects and specialisation pathways to choose from. Such specialisation is built on several steps starting with general knowledge to field-based to area and discipline-based knowledge. Having most of the courses as compulsory (before specialisation) may restrict the flexibility of choosing specialisation pathways.

11. Most of the courses are theory based and as such assessments are exam/class test based.

12. There are some soft skill development focused courses like Entrepreneurship, Research Methods and Leadership and Team Building where both theoretical and practical aspects of soft and research skills are taught and experienced through case studies and group projects and presentations.

13. From the documents provided, it is not clear how the theory part of each course is delivered, however, from the feedback it was clarified that the lectures are delivered through presentations, discussions and group discussions. For some general courses like Philosophy, group discussion or case studies are more effective than lecture only.

14. For practical sessions, information regarding class size and available resources is necessary to evaluate the effectiveness of the practical sessions.

Learning and Teaching

15. The programme offers a strong mathematical foundation particularly of algebra and calculus.

16. In terms of programming language, the programme focuses mainly on object oriented programming (OOP) like Java or C. However, for modern MIS, the scripting languages like Python/R are more used than OOP. However, both these scripting languages are covered through different courses.

17. The programme has several database/data warehouse courses, however most of the courses are traditional SQL based structured data warehousing techniques-based. The addition of some cloud-based unstructured/real-time data warehousing systems like AWS/Datalake would benefit the students.

18. In relation to data collection approaches, the programme covers a wide range of data collection techniques from sensors to public databases. This is very important for any type of Information Systems programme and of course for MIS. However, with business/marketing related IS, the web and especially social media is the main source of data collection. The technology and methodology of collecting data from social media would benefit students.

19. The programme also has a focus on computer network (design, deployment, security etc.). Although network is an important topic for IS, it would be useful to include DevOps into the mix. Since DevOps in conjunction with network underpins the efficiency of the

information system of an organisation, including this topic, either alongside networks or separately, can benefit the programme.

20. Machine learning algorithms are included through different courses. These machine learning algorithms are primarily unsupervised type of algorithms like clustering, association etc. At present more neural net-like algorithms are used in management, finance, marketing (i.e. specialisation areas). In depth understanding and application of neural net type algorithms would benefit all specialisation pathway students (although neural net is briefly included in decision support system course). Last but not least, natural language processing/generation type of algorithms are critical for business/marketing and therefore inclusion will benefit the students.

21. Critical understanding about code sharing (github etc.) seems to be missing. For data science programme it is important that students are aware and have experience of code sharing, documentation and different licenses used for open-source software/algorithm development.

22. The programme has extensive project management, entrepreneurial courses that benefit students.

23. Reference books/materials need to be updated, particularly the Management and business information systems courses.

Assessment and feedback

24. Well established assessment and feedback capture mechanism.

25. Student feedback is captured via an end of semester form. Feedback on four categories – module content, teaching activities, exams/assessment and facilities are captured via a 1 – 5 scale.

Conclusion and Recommendations

26. Teaching modality
    a. More discussion-based teaching approach including flip classroom type teaching model can be introduced to increase student engagement and self-directed study.
    b. Project-based learning approaches can be implemented to get more knowledge about different real-life projects, their short comings etc.

27. Teaching content
    c. Low code/No code based programming are becoming popular (10.3390/electronics10101192) in universities with the rise of online education and as a result of COVID-19. Adaptation with new trends will help students to develop new applications/algorithms more easily. This impacts not only skill development but confidence also.
    d. In this regard API based programming like GPT-3 like language model (from OpenAI etc.) to any software/app would benefit students with high quality trained dataset/model integration.
    e. Analysis of real-life data from different domains (finance, healthcare, social media etc.) is essential to get understanding about different data sources and types.
    f. Engagement with stakeholders and requirement capture is pivotal. Therefore, with different types of programming/machine learning courses these aspects need to be included.
    g. Use of online content/courses can introduce students to new topics and choice of learning sources (in contrast to recommended book). This diversity of content and modality of delivery not only helps students to be in line with current trends but also initiate peer learning.

h. Skill development on code sharing (through github etc.) and open licence needs to added to the course curriculum along with collaborative code development (e.g. Google Colab, AWS).
i. Cyber security aspect of software/algorithm design and development can be improved by incorporating some topics from cyber security, particularly access control to source code and sensitive data (e.g. health data).
j. Basic understanding of how to protect intellectual property rights related to algorithms and the process of protecting these rights through third party.
k. Critical understanding of research methods in higher education and steps involved from idea generation through to publication and/or application can be incorporated.
l. Basic knowledge of social media-based profile creation e.g. LinkedIn profile that will facilitate future job prospects can be incorporated to develop profile.

28. Assessment
m. More emphasis on project based assessments (instead of exams) would help students to get experience of team work and other aspects of project management.

CRITERIA

Column headings (left to right): Marxist-Leninist Phylosophy · Marxist-Leninist Political Economy · Scientific Socialism · Ho Chi Minh Ideology · History of the Communist Party of Vietnam · English B1 · English B2 · Physical Education · National Defense Education · English for Academic Purposes 1 · Programming 1 · Programming 2 · Advanced Mathematics · Theory of Probability and Mathematical Statistics · Introduction to Computer Networks · Introduction to Psychology · Introduction to Management Information Systems · Introduction to Law · Microeconomics · Macroeconomics · Business Organizational Management · Data Structures and Algorithms · Business Information Systems and Processes · Quantitative Methods for Management · Web Authoring and Web Management · Database Systems · IT and Business Innovation · Intellectual Property Rights · Operations Management · Data Mining and Business Analytics · Mobile and Pervasive Technology · Dot Net Framework · Information Systems Management · Java Programming · Information Systems Modeling and Design · IT Project Management · Enterprise Business Solutions · Enterprise Information Systems · Principles of Information Security · Enterprise Analytics for Decision Support · Entrepreneurship · Multimedia Design and Web Development · E-Commerce · Advanced Database Development · Information Technology Planning and Infrastructure · Retailing Banking Processes and Technology · E-Payment Processes and Technology · Mobile Commerce · Computer Based Technologies · IT Research Methods · Leadership and Team Building · Legal, Ethical, Social Environment of Business · Introduction to Sociology · Decision Support Systems · Good Information Systems · Network Security · Data Warehousing and Business Analytics · Artificial Intelligence · (Finance courses) · (Marketing courses) · (Real Estate courses) · Internship · Graduation Thesis · Organizational Strategy · Advanced Information Systems Development

PROGRAMMING

Criteria	Mapped courses (score)
General knowledge on different software/algorithm, their application, strengths and limitations.	Data Structures and Algorithms 95; Business Information Systems and Processes 86; Quantitative Methods for Management 92; Information Systems Management 94; Java Programming 84; Information Systems Modeling and Design 84; IT Project Management 84; Enterprise Business Solutions 87; Enterprise Information Systems 84; Principles of Information Security 94; Multimedia Design and Web Development 83; Decision Support Systems 93; Network Security 91; Data Warehousing and Business Analytics 91
Knowledge and skill to undertake requirement analysis. Ability to collect and summarise the requirements. Also understand the market demand/trend in context of software/algorithm development.	Business Information Systems and Processes 89; Quantitative Methods for Management 91; Java Programming 91; IT Project Management 90; Enterprise Business Solutions 93; Enterprise Information Systems 84; Principles of Information Security 95; Data Warehousing and Business Analytics 81
Ability to work in a team environment and understanding of the importance of communication in a multi disciplinary/institutional team environment.	Information Systems Management 92; Enterprise Information Systems 81; Principles of Information Security 84; Enterprise Analytics for Decision Support 86
Demonstrate the knowledge and skill of project management. Particularly the differentiation and applicability of different types of project management approaches and the relevance to the project in hand.	Data Structures and Algorithms 89; Information Systems Management 94
Demonstrate critical understanding of the software/algorithm design approaches and availability of design tools	Data Structures and Algorithms 83; Web Authoring and Web Management 91; Database Systems 89; Data Mining and Business Analytics 92; Information Systems Management 91; Information Systems Modeling and Design 94; Enterprise Analytics for Decision Support 78; Data Warehousing and Business Analytics 92
Demonstrate critical understanding of the software/algorithm development approaches and availability of development tools/languages.	Database Systems 83; Dot Net Framework 96; Information Systems Modeling and Design 91; IT Project Management 90
Critical knowledge about the importance of software/algorithm evaluation/testing and the steps of releasing.	Database Systems 83; IT Project Management 90; Enterprise Analytics for Decision Support 98; Computer Based Technologies 83
Critical knowledge about the importance of software/algorithm security related issues.	Theory of Probability and Mathematical Statistics 86; Data Warehousing and Business Analytics 97
Demonstrate critical knowledge on both object oriented and scripting languages.	Mobile and Pervasive Technology 91
Ability to code in distributed cloud as well as stand-alone environment using wide range of programming languages.	Advanced Mathematics 67
Good knowledge on privacy, security issues related to software/hardware/algorithm.	Advanced Mathematics 78
Critical understanding of code sharing, archiving and protection through cloud-based repository platforms.	Mobile and Pervasive Technology 84; Mobile and Pervasive Technology 94
Good knowledge about different cloud based computing platforms. e.g. AWS	Advanced Mathematics 76
Understanding about opensource/stand-alone/cloud-based software/hardware/algorithm.	
Critical knowledge on computing performance and how to address performance related challenges.	

KNOWLEDGE MANAGEMENT

Criteria	Mapped courses (score)
Good understanding about big data and their impact on business and society.	Data Structures and Algorithms 95; Information Systems Management 83; Java Programming 89; Information Systems Modeling and Design 83; Enterprise Analytics for Decision Support 83; Data Warehousing and Business Analytics 82
Critical knowledge about different steps of data management pipeline – from collection to data analytics	Business Information Systems and Processes 83; Information Systems Management 85; Java Programming 95; Data Warehousing and Business Analytics 92
Critical understanding about different data types, sources of data types and their strengths and limitations.	Data Structures and Algorithms 92; Web Authoring and Web Management 83; Information Systems Management 89; Java Programming 92; Enterprise Information Systems 86
Critical understanding about different data collection processes and resources along with regulations associated to the processes including ethics and permission requirements.	Information Systems Management 82; Java Programming 93
Demonstrate the knowledge on data privacy and it differs in different domains – manufacturing, medical etc.	
Critical understanding about data quality, particularly standard process of measuring data quality.	
Demonstrate the appreciation towards the importance of data cleaning and knowledge on different steps, tools used for data cleaning.	Data Warehousing and Business Analytics 76
Understanding about the data validation process and its importance towards data management.	Business Information Systems and Processes 82; Web Authoring and Web Management 85; Data Warehousing and Business Analytics 84
Good knowledge about different data warehousing techniques and technical details for implementing different types of databases.	Web Authoring and Web Management 95; Information Systems Management 91; Information Systems Modeling and Design 95; Good Information Systems 90; Data Warehousing and Business Analytics 94
Updated knowledge about data warehousing for both structured and unstructured data.	Information Systems Management 81; Information Systems Modeling and Design 93; Data Warehousing and Business Analytics 92
Critical knowledge about the approach to query the data as per the requirements of the users.	
Good understanding about the process of data transformation in relation to the users requirements.	
Provide detailed knowledge and skill on different data security related issues and how to identify different types of threats.	Mobile and Pervasive Technology 86
Explain different types of data protection measures that can be taken to safeguard data breach.	
Understand institutional policies related to data security and privacy and tools required to implement these policies.	
Good understanding about intellectual property rights and governance laws.	

KNOWLEDGE ABSTRACTION

Criteria	Mapped courses (score)
Demonstrate good knowledge of algebra and calculus that enables students to refresh their high school math knowledge.	Theory of Probability and Mathematical Statistics 97; Introduction to Management Information Systems 81
Provide detailed understanding of distribution and probability statistics.	Theory of Probability and Mathematical Statistics 97
Critical understanding on intelligent agent and different types of logic representations.	Data Mining and Business Analytics 85; Good Information Systems 90; Artificial Intelligence 83
Different algorithms (un/supervised, adaptive) – their applications and refinement of algorithm parameters.	Data Mining and Business Analytics 83; Good Information Systems 89; Artificial Intelligence 71
Critical knowledge on algorithm testing, evaluation and optimisation.	Artificial Intelligence 64
Good understanding of ethics and policy related to algorithm development and deployment.	
Up to date knowledge on state of the art algorithms implemented by different stakeholders.	Good Information Systems 82; Artificial Intelligence 93
Basic understanding on how to protect intellectual property rights related to algorithms and the process of protecting these rights through third party.	
Provide detailed understanding of algorithms used for image analysis and object detection from including timelapse and multimodal images.	

KNOWLEDGE REPRESENTATION/COMMUNICATION

Criteria	Mapped courses (score)
Evaluate and apply data visualisation grammar and principle to the whole of the visualisation process and the resulting presentations.	
Evaluate the capabilities of different visualisation tools and programming languages, both proprietary and open-source, to support the discovery and display of critical and valuable answers hidden in small, medium and large data.	Multimedia Design and Web Development 89
Implement analysis and visualisation techniques using realistic data sources from disparate disciplines and using the most appropriate visualisation tools in order to identify the valuable questions and to develop well justified, actionable answers.	Multimedia Design and Web Development 92
Good understanding of processes to know the audience in terms of their requirements, domain knowledge etc. Differentiate between exploratory and explanatory data visualisation and or knowledge representation.	

RESEARCH/SOFT SKILLS

Criteria	Mapped courses (score)
Understanding of core aspects of philosophy and its sub discipline.	Business Organizational Management 87; Data Structures and Algorithms 86; Information Systems Management 82; Computer Based Technologies 82
Explore and express different ideas of philosophy and their relevance to research in higher education.	Information Systems Management 74; IT Research Methods 89
Introduction to the main ideas of logic and methods of recognising relevant information to construct persuasive arguments.	Data Structures and Algorithms 83; IT Research Methods 85
Develop analytical, argumentative problem-solving skills.	Data Structures and Algorithms 94; Business Information Systems and Processes 94; Dot Net Framework 81
Develop critical thinking and problem-solving skill in a collaborative manner.	Data Structures and Algorithms 92; Business Information Systems and Processes 92; Dot Net Framework 80
Critical understanding of research methods in higher education and steps involved from idea generation through to publication and or application.	Data Structures and Algorithms 91
Critical understanding of project management and role of different team members at different levels along with the interplay.	Data Structures and Algorithms 89; Information Systems Management 91; Java Programming 91
Knowledge about different administrative and operational tasks required for successful project management.	Data Structures and Algorithms 93; Computer Based Technologies 93
Basic understanding of activities related to dissemination of research outcome to wider audience.	Data Structures and Algorithms 83; Computer Based Technologies 91
Basic knowledge of social media-based profile creation e.g. LinkedIn profile that will facilitate future job prospects.	91