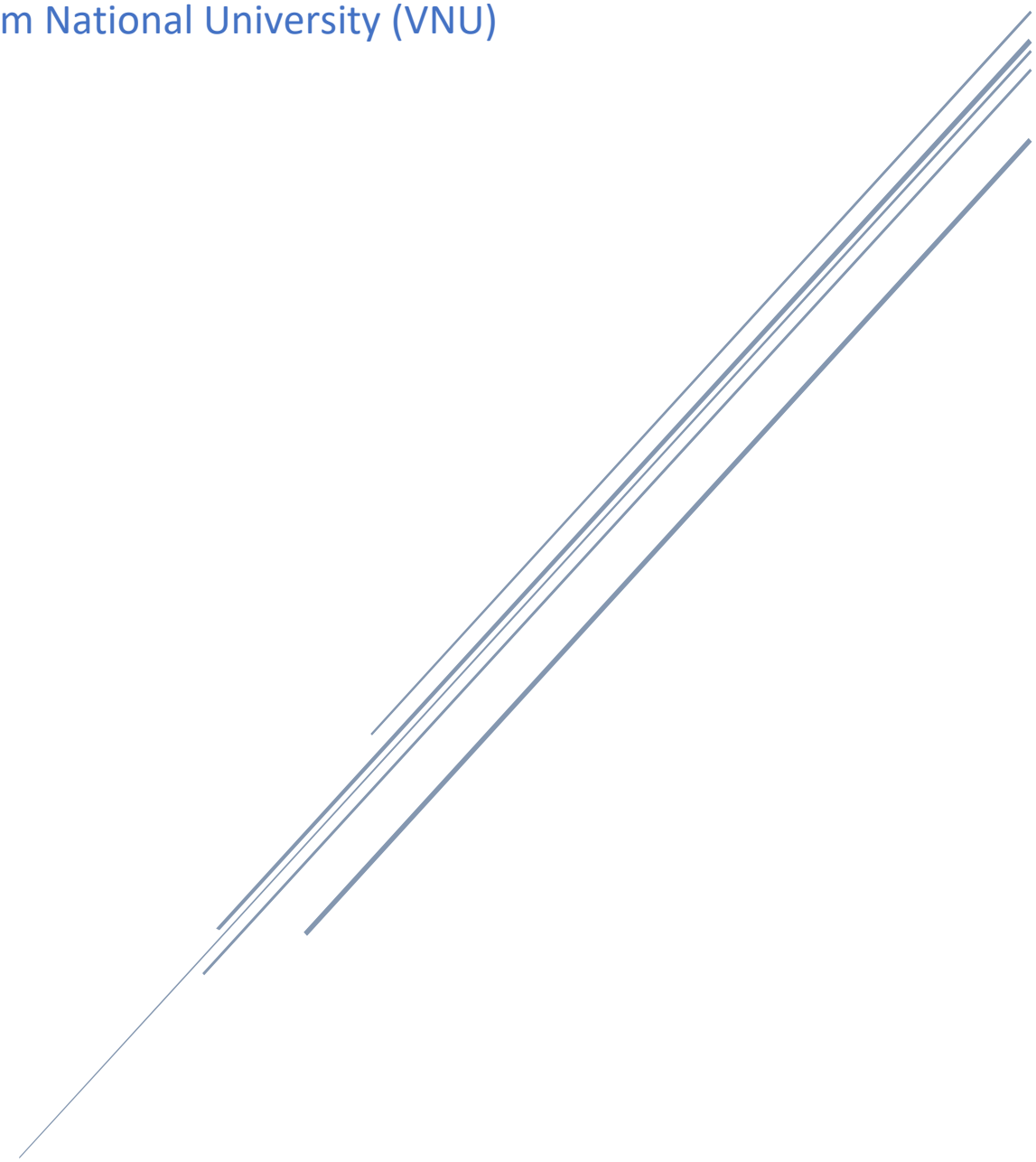
EQUIP UK★VN
Enabling an environment of QUality for International HE Partnerships between the UK and Viet Nam

BRITISH COUNCIL

OBJECTIVE 2 – QUALIFICATION BENCHMARKING

Bachelor of Informatics and Computer Engineering (ICE)
Vietnam National University (VNU)



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Introduction

The Bachelor of Informatics and Computer Engineering (ICE) programme at Viet Nam National University provides fundamental concepts and applications of information systems and computer engineering. This is a specialised programme and for this benchmarking exercise we focus only on modules/courses related to Information Systems (not computer engineering courses)

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 skills). **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 a 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 152 credit programme focuses on Informatics and Computer Engineering (ICE) with emphasis on Computer Engineering (CE). The programme provides a step-wise knowledge development approach.

2. Field-based knowledge (34 credits) introduces students to basic concepts of Russian and English language, along with basics of information systems, mathematics, physics and comp engineering.

3. Area-based knowledge (18 credits) further enhances the knowledge of mathematics, data structure using object-oriented programming language like C.

4. The discipline knowledge (29 credits) courses provide an advanced knowledge on mathematics and widen the engineering knowledge, particularly electrical and electronics engineering. Introduction to intellectual property rights as a course provides a unique advantage for the students.

5. Upon development of the foundational knowledge and skill sets, the programme then focuses on specialised knowledge (50 credits) with 20 different courses on offer. Most of these courses are Computer Engineering focused and include advanced topics of Computer Engineering like simulation of digital circuits.

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

Mode of Delivery

7. 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.
8. Most of the courses are theory based and as such assessments are exam/class test based.
9. 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.
10. 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 discussions or case studies are more effective than lecture only.
11. For practical sessions, information regarding class size and available resources is necessary to evaluate the effectiveness of the practical sessions.

Learning and Teaching

12. The programme offers a strong mathematical foundation particularly on algebra and calculus. This is pivotal for Information systems as well as engineering.
13. The programme offers a wide range of topics with its 64 courses/modules. However, both IS and CE are vast subject areas to cover and usually are considered as separate subjects and taught as different programmes.
14. A joint degree programme is difficult to manage, and students often find difficulties to choose the right courses/pathway to shape their degree. From the syllabus it was not clear how students were advised/guided in terms of specialisation and the balance between IS and CE.
15. From IS perspective, the programme focuses only on object oriented languages like C. It would be beneficial to include scripting language like Python in courses like Programming 1 or 2.
16. The programme has only one course related to data management (Databases). The course also lacks cloud-based unstructured/real-time data warehousing systems like AWS/Datalake.
17. The programme provides a strong math and statistics basis to facilitate understanding of different algorithms. However, machine learning algorithms were not covered well in this programme. From IS perspective this may put students in a disadvantageous position as modern IS systems use some sort of algorithms.
18. 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.

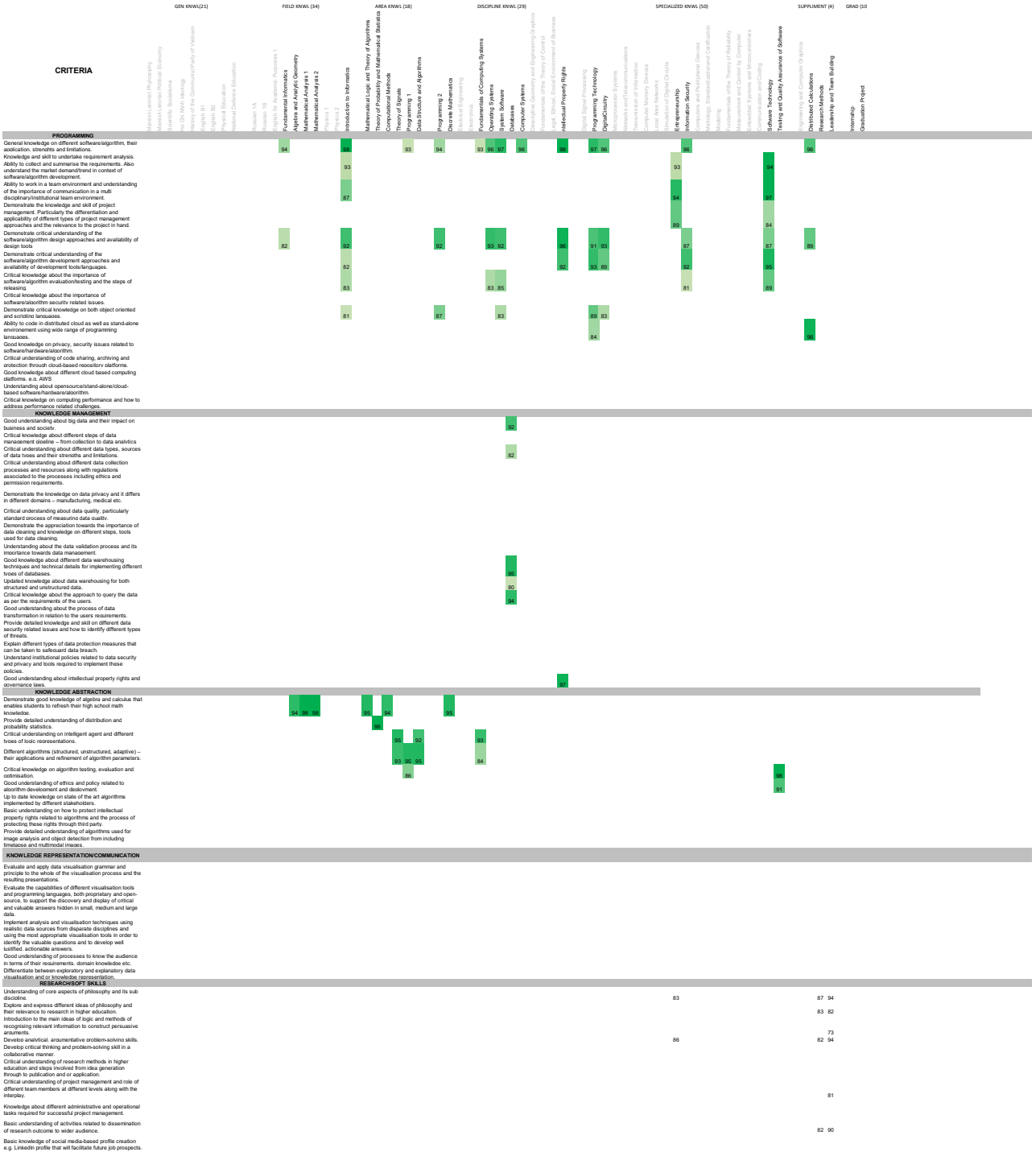
Assessment and feedback

19. Well established assessment and feedback capture mechanism.

20. 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

21. 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 approach can be implemented to get more knowledge about different real-life projects, their short comings etc.
22. 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. More emphasis can be given to scripting languages like Python.
    e. 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.
    f. Analysis of real-life data from different domains (finance, healthcare, social media etc.) is essential to get understanding about different data sources and types.
    g. Engagement with stakeholders and requirement capture is pivotal. Therefore, with different types of programming/machine learning courses these aspects need to be included.
    h. 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.
    i. 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).
    j. 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).
    k. Basic understanding of how to protect intellectual property rights related to algorithms and the process of protecting these rights through third party.
    l. Critical understanding of research methods in higher education and steps involved from idea generation through to publication and/or application can be incorporated.
    m. Basic knowledge of social media-based profile creation e.g. LinkedIn profile that will facilitate future job prospects can be incorporated to develop profile.
23. Assessment
    n. More emphasis on project based assessments (instead of exams) would help students to get experience of team work and other aspects of project management.


GEN KNWL(21)
FIELD KNWL (34)
AREA KNWL (18)
DISCIPLINE KNWL (29)
SPECIALIZED KNWL (50)
SUPPLIMENT (4)
GRAD (10
CRITERIA
Marxist-Leninist Philosophy
Marxist-Leninist Political Economy
Scientific Socialisme
Ho Chi Minh Ideology
History of the Communist Party of Vietnam
English B1
English B2
Physical Education
National Defence Education
Russian 1A
Russian 1B
English for Academic Purposes 1
Fundamental Informatics
Algebra and Analytic Geometry
Mathematical Analysis 1
Mathematical Analysis 2
Physics 1
Physics 2
Introduction to Informatics
Mathematical Logic and Theory of Algorithms
Theory of Probability and Mathematical Statistics
Object-Oriented Methods
Theory of Signals
Programming 1
Data Structure and Algorithms
Programming 2
Discrete Mathematics
Electrical Engineering
Electronics
Fundamentals of Computing Systems
Operating Systems
System Software
Database
Computer Systems
Security Geometry and Engineering Graphics
Fundamentals of the Theory of Control
Legal, Ethics, Social Environment of Business
Intellectual Property Rights
Digital Signal Processing
Programming Technology
DigitalCircuitry
Microprocessor Systems
Fundamentals of Automation
Business Law
Computer Memory Devices
Local Area Networks
Simulation of Digital Circuits
Entrepreneurship
Information Security
Computers and Peripheral Devices
Metrology, Standardisationand Certification
Modeling
Fundamentals of the Theory of Reliability
Measurements and Control by Computer
Computer Aided Design of Microcontrollers
Computer Vision and Coding
Software Technology
Testing and Quality Assurance of Software
Engineering and Computer Graphics
Distributed Calculations
Research Methods
Leadership and Team Building
Internship
Graduation Project
PROGRAMMING
General knowledge on different software/algorithm, their application. strenghts and limitations.
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.
Ability to work in a team environment and understanding of the importance of communication in a multi disciplinary/institutional team-environment.
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.
Demonstrate critical understanding of the software/algorithm design approaches and availability of design tools
Demonstrate critical understanding of the software/algorithm development approaches and availability of development tools/languages.
Critical knowledge about the importance of software/algorithm evaluation/testing and the steps of releasing.
Critical knowledge about the importance of software/algorithm security related issues.
Demonstrate critical knowledge on both object oriented and scriptina lanauaaes.
Ability to code in distributed cloud as well as stand-alone environement using wide range of programming lanauaaes.
Good knowledge on privacy, security issues related to software/hardware/algorithm.
Critical understanding of code sharing, archiving and protection through cloud-based repository platforms.
Good knowledge about different cloud based computing platforms. e.g. AWS
Understanding about opensource/stand-alone/cloud-based software/hardware/algorithm.
Critical knowledge on computing performance and how to address performance related challenges.
KNOWLEDGE MANAGEMENT
Good understanding about big data and their impact on business and society.
Critical knowledge about different steps of data management pipeline – from collection to data analytics
Critical understanding about different data types, sources of data types and their strenaths and limitations.
Critical understanding about different data collection processes and resources along with regulations associated to the processes including ethics and permission requirements.
Demonstrate the knowledge on data privacy and it differs in different domains – manufacturing, medical etc.
Critical understanding about data quality, particularly standard process of measurina data quality.
Demonstrate the appreciation towards the importance of data cleaning and knowledge on different steps, tools used for data cleaning.
Understanding about the data validation process and its importance towards data management.
Good knowledge about different data warehousing techniques and technical details for implementing different types of databases.
Updated knowledge about data warehousing for both structured and unstructured data.
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.
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
Demonstrate good knowledge of algebra and calculus that enables students to refresh their high school math knowledge.
Provide detailed understanding of distribution and probability statistics.
Critical understanding on intelligent agent and different types of logic representations.
Different algorithms (structured, unstructured, adaptive) – their applications and refinement of algorithm parameters.
Critical knowledge on algorithm testing, evaluation and optimisation.
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.
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
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.
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.
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
Understanding of core aspects of philosophy and its sub discipline.
Explore and express different ideas of philosophy and their relevance to research in higher education.
Introduction to the main ideas of logic and methods of recognising relevant information to construct persuasive arauments.
Develop analytical. argumentative problem-solving skills.
Develop critical thinking and problem-solving skill in a collaborative manner.
Critical understanding of research methods in higher education and steps involved from idea generation through to publication and or application.
Critical understanding of project management and role of different team members at different levels along with the interplay.
Knowledge about different administrative and operational tasks required for successful project management.
Basic understanding of activities related to dissemination of research outcome to wider audience.
Basic knowledge of social media-based profile creation e.g. LinkedIn profile that will facilitate future job prospects.