МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
ХАРКІВСЬКИЙ НАЦІОНАЛЬНИЙ ЕКОНОМІЧНИЙ УНІВЕРСИТЕТ
ІМЕНІ СЕМЕНА КУЗНЕЦЯ

ЗАТВЕРДЖЕНО
на засіданні кафедри
кібербезпеки та
інформаційних технологій
Протокол № 2 від 31.08.2023 р.

ПОГОДЖЕНО
Проректор з навчально-методичної роботи

_____Каріна НЕМАШКАЛО

БІЗНЕС ІНТЕЛЕНДЖЕНС

робоча програма навчальної дисципліни (РПНД)

Галузь знань	**всі**
Спеціальність	**всі**
Освітній рівень	**другий (магістерський)**
Освітня програма	**всі**

Статус дисципліни	**вибіркова**
Мова викладання, навчання та оцінювання	**англійська**

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Завідувач кафедри
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Харків
2023

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
SIMON KUZNETS KHARKIV NATIONAL UNIVERSITY OF ECONOMICS

APPROVED
at the session of
the Department of Cybersecurity and
Information Technologies
Protocol № 2 31.08.2023.

AGREED
Vice-Rector for Educational and
Methodical Work

_____ Karina NEMASHKALO

BUSINESS INTELLIGENCE

Syllabus of the academic discipline (SAD)

Area of expertise	**All**
Speciality	**All**
Grade level	**second (magister's)**
Academic Program	**All**

Discipline status	**selective**
Language of teaching, learning and assessment	**English**

Developer(s):

_____ Oleksii LEUNENKO

c.t.s., ass. prof. _____ Olena SHAPOVALOVA

Head of Department
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Kharkiv
2023

INTRODUCTION

It should be noted that modern enterprises and organizations must analyze ultra-large amounts of data to ensure their competitiveness. This applies both to commercial enterprises that will receive large unstructured data on their customers' preferences and requests, and to utilities and public organizations that must process significant data from IoT tools, such as heat meters, traffic reports, etc. However, obtaining such data and its primary processing are not the only tasks that make a company competitive in today's environment. It is necessary to react quickly to the relevant data or its changes to formulate management decisions to promote the emergence of innovative products and services.

The concept of business intelligence (BI) is a translation from English that covers a significant layer of business performance analytics and denotes a hierarchical and synergistic set of concepts, technologies, and software tools for transforming primary data and visualizing the results to support informed decision-making. In fact, the area of "business intelligence" is the provision of visualization of primary data for the purpose of their further processing, including conventional statistical methods and similar techniques, as well as the latest means of machine learning, artificial intelligence, etc. Therefore, the discipline of Business Intelligence is promising and relevant, as it considers solutions for displaying, consolidating, and visualizing data, turning it into an effective means of doing business.

The purpose of the discipline is to form a system of competencies in the use of effective tools for processing and presenting business data with the subsequent use of the acquired knowledge to optimize business management, as well as to promote a systematic representation of the architecture of relevant technology platforms based on web solutions and cloud computing.

The objectives of the discipline are:

– mastering the basic methods of obtaining data from various sources, cleaning and transforming them for analysis;

– mastering the techniques of visualizing primary data for the purpose of their further processing using both conventional statistical methods and similar techniques, as well as machine learning, artificial intelligence, etc.;

– gaining knowledge in the field of querying, consolidation, and visualization of data to turn it into an effective business tool.

The object of study of the discipline is raw statistical data and the process of their analysis.

The subject of the discipline is the methods, tools and technologies of transformation, processing, and presentation of information.

The results of training and competence that forms the academic discipline are defined in Table 1.

Table 1

Learning outcomes and competencies that form the academic discipline

Learning outcomes	Competencies that a higher education applicant should master
Critically comprehends, select and use the necessary scientific, methodological and analytical tools for management in unpredictable conditions.	Skills in the use of information and communication technologies. Ability to select and use management concepts, methods and tools, including in accordance with defined goals and international standards.
Have the skills to make, justify and ensure the implementation of management decisions in unpredictable conditions, taking into account the requirements of current legislation, ethical considerations and social responsibility.	Skills in the use of information and communication technologies. Ability to analyze and structure organizational problems, make effective management decisions and ensure their implementation.
To apply specialized software information systems to solve organiza management problems.	Ability to self-development, lifelong learning and effective self-management.

PROGRAM OF DISCIPLINE

Course Content

Content Module 1. Considerations for choosing and applying BI tools.

Topic 1. Fundamental terms and definitions. Features of Data Mining and Business Analytics technologies and the place of BI in modern business processes of enterprises and organizations.

1.1. Main terms and definitions.

Definition and essence of the concepts of Business Intelligence (BI) and business analytics. The history of the term "BI". Elements of Business Intelligence. and cost of production. Changing business environment and computerized decision support.

1.2. Features of Data Mining and Business Analytics technologies.

Classification of structures for Business Intelligence. Technologies of in-depth data analysis (Data Mining). User interface: Dashboards and other means of information broadcasting. Advantages and disadvantages of BI in the enterprise information ecosystem.

1.3. The place of BI in modern business processes of enterprises and organizations.

Development and usage of information and BI management. BI Governance. A typical set of questions for a business intelligence management team. Basic theories and characteristics of business intelligence. The strategic imperative of BI. Classification of typical BI users.

Topic 2. Data warehouses features.

2.1. Understanding and comparing a data warehouse and a data lake.

The concepts of Data Warehouse and Data Lake. Comparison of Data Warehouse and Data Lake. Facts for measurements. Dimensions to describe the context.

2.2. Bill Inmon's top-down approach to building a data warehouse.

The main characteristics of Bill Inmon's approach. Primitive and derived data. The concept of a corporate information factory.

2.3. Ralph Kimball's bottom-up approach to building a data warehouse.

The main characteristics of the Kimball approach. Four steps of DWH design. Drilling Down and Drilling Up approaches. Surrogate keys. Slowly changing dimensions. Types of fact table.

2.4. Dan Linstedt's data warehouse.

Definition of a data warehouse according to Dan Linstedt. The main characteristics of Dan Linstedt's data warehouse. Levels of data warehouse. The architecture of the data warehouse. Basic types of model entities.

Topic 3. SQL. Introduction to DBMS, familiarization with MySQL.

3.1. Basic definitions. DBMS functions.

Functions of the IS. Definition of a database. Database management system (DBMS). The concept of a data bank. Distribution of responsibilities in systems with databases. Classification of DBMS functions. Additional services, utilities.

3.2. Architecture of the database organization.

Database standardization. Three-level architecture of the database organization. External level. Conceptual level. The internal level. Reflection. Logical and physical independence of data. Architecture of software and hardware. Correspondence of the logical architecture of the database and the software and hardware architecture. N-level architecture. Definition of data and data models. Classification of data models.

Classification of data models.

3.3. MySQL database.

MySQL database management system. Licensing. Features and system requirements. Branches of MySQL.

Topic 4. SQL. Relational data model.

4.1. Relational data structure.

History of the relational data model. Advantages and disadvantages of the relational data model. Theoretical basis of relational databases: set theory and relational algebra (algebra of relations). Relational data structure according to K. Data.

4.2. The structural part of a relational database.

The structural part of a relational database. The concept of a relationship and a table. The concept of attribute and domain. Data tuples. The header and body of the relationship. Numerical characteristics of the relationship. The degree of the relationship. Cardinality. Part of the integrity of a relational database. Domain constraints. Relational key. Types of relational keys. Entity integrity rule. Foreign keys and types of relationships.

4.3. The manipulative part of a relational database. SQL standards.

The concept of the manipulative part of a relational database. Interactive and embedded SQL. Data definition language (DDL). Data manipulation language (DML): query language (DQL) and data control language (DCL). Transaction control language (TCL).

Topic 5. SQL. Data types, aggregation functions, data sorting.

5.1. Common data types in SQL.

Symbols. Numbers. Logical data. Date and time. Intervals.

5.2. SQL operations.

Prioritization of operations. Arithmetic operations. Comparison operations. Logical operations.

5.3. SQL queries.

Query definition. Eliminating redundancy in the selected data. Refine the query using predicates. Grouping records by the values of one or more columns. Organizing the result table. Using aggregate functions.

Topic 6. SQL subqueries.

Using subqueries. Using quantifiers. Subqueries and aggregate functions. Linked (correlated) subqueries. Using the EXISTS predicate.

Content module 2: Basics of designing effective BI solutions.

Topic 7. BI tools. An example of using Microsoft Power BI to visualize business data and create reports.

7.1. Differences between Power BI and Tableau.

Overview of Business Intelligence software systems. Overview of Microsoft Power BI Overview of Tableau. Differences between Power BI and Tableau.

7.2. Microsoft Power BI.

Editions of Microsoft Power BI. Types of Power BI licenses and their differences. Power BI architecture. Types of data sources that are supported. The main components of Power BI. Connecting to data. Comparison of Import and Direct Query. Getting to know the interface. Visualization in Power BI.

7.3. Power BI Desktop.

The formatting area in Power BI Desktop. The analytics dashboard in Power BI Desktop. Power Query and Power Pivot engines. Query editor. Language M. Introduction to DAX.

Topic 8. Modeling. Creating and managing relationships in Microsoft Power BI.

8.1. Developing a data model in Power BI.

Requirements for a good data model. Star diagrams. Creating a visual object in Power BI.

8.2. Working with tables in Power BI.

Customize the properties of tables and columns. Create a date table. Creating a general date table. Creating a general date table - DAX. Creating a general date table - Power Query. Marking a table as an accepted date table.

8.3. Working with measurements in Power BI.

Definition of measurement. Hierarchies. Hierarchy of the "parent-child" type. Summary of the parent-child hierarchy. Role dimensions.

8.4. Determining the level of data granularity in Power BI.

Data granularity. Determining the degree of data granularity. Change the level of data granularity to build relationships between two tables. Column joins. Create a relationship between tables. Create DAX measures for calculation.

8.5. Working with relationships and multiples in Power BI.

The "many to one" ratio. One-to-one relationship. The ratio of many to many. The direction of the cross filter. Multiplicity and direction of the cross-filter. Solving modeling problems. Relationship dependency.

Topic 9. Microsoft Power BI. DAX.

9.1. Introduction to DAX in Power BI.

The language of formula expressions DAX (Data Analysis Expressions). The syntax of DAX. Using the FILTER function in DAX. Calculated columns and indicators in Power BI. Calculated tables in Power BI. Quick indicators. Slicers in Power BI. Visual interactions. Dynamic measurements. Power BI filtering. The order of Power BI operations. Options in Power BI Desktop. Options for connecting to a data source. Options for filtering data. Options for control statement logic. Combining and grouping data. Using the analysis function.

9.2. Visualize data in Power BI.

Detail mode in a visual representation in Power BI. Power BI buttons. Detailing in Power BI. Bookmarks and how to use them. Power BI Q&A. Integrating Python/R into Power BI. Row-level security (RLS) with Power BI.

Topic 10. Features of cloud computing technologies in solving BI tasks

10.1. Publishing datasets and reports from Power BI Desktop.

Power BI services. Power BI Dataflow. Comparison of Dataflow and Dataset. Reports, workbooks, data panels. Comparison of Power BI Desktop and Power BI services.

10.2. Power BI performance.

Power BI Gateway. Monitoring report performance in Power BI. Optimizing Power BI performance.

The list of laboratory sessions for the academic discipline is provided in Table 2.

Table 2

The list of laboratory sessions

Topic name and task name	Content
Topic 1-2. Laboratory work 1.	Comparison of the characteristics of modern BI tool solutions.
Topic 3. Laboratory work 2.	Create a presentation in PowerPoint
Topic 4-5. Laboratory work 3.	Excel Power Tools for data analysis
Topic 6. Laboratory work 4.	Creating queries in SQL
Topic 7-8. Laboratory work 5.	Introduction to Microsoft Power BI, connecting and working with data. Data visualization and filtering
Topic 9-10. Laboratory work 6.	Microsoft Power BI. Syntax and DAX operators

The list of independent work for the academic discipline is provided in Table 3.

Table 3

The list of independent work

Topic name and task name	Content
Topic 1 - 10	Study of lecture material and MS Excel, Microsoft Power BI help system
Topic 1 - 10	Preparing for laboratory classes
Topic 1 - 10	Performing individual educational and research tasks

The number of hours of lecture and laboratory classes and hours of independent work is given in the work plan (technological map) for the academic discipline.

TEACHING METHODS

During the teaching process to achieve specific learning outcomes, the activation of the educational process involves the use of various teaching methods, including:

Verbal methods: (lecture (Topics 1, 3, 4, 7), problem-based lecture (Topics 2, 5, 8, 9, 10).

Visual methods: demonstration (Topic 1-10).

Practical (laboratory works (Topic 1 – 10)).

FORMS AND METHODS OF EVALUATION

The university uses a 100-point cumulative grading system to evaluate the learning outcomes of higher education students.

Current assessment is carried out during lectures, practical sessions, laboratory work, and seminars to assess the level of preparedness of higher education students for specific tasks. It is evaluated by the total number of points obtained:

– for subjects with semester assessment (credit) format: the maximum score is 100 points, and the minimum score is 60 points.

The final control includes semester control and certification of the applicant for higher education.

The final assessment includes semester assessment and certification of higher education students.

The final grade for the academic discipline is determined as follows:

– for subjects with semester assessment (credit) format: by summing up all the points obtained during current assessment.

The following control measures are used during the teaching of the discipline:

Current control: laboratory work (80 points), written tests (20 points).

Semester control: credit (based on the aggregate of all points received during the semester). More detailed information on the assessment system is provided in the work plan (technological map) of the discipline.

RECOMMENDED LITERATURE

Main

1. A Guide to the Business Analysis Body of Knowledge (BABOK Guide). – 4rd Edition. –IIBA. – 2022. – 502 p.

2. Collier Michael S. Microsoft Azure Essentials: Fundamentals of Azure, Second Edition / Michael S. Collier and Robin E. Shahan // Microsoft Press, 2021. – 246 p.

4. Barnes J. Microsoft Azure Essentials: Azure Machine Learning / Jeff Barnes // Microsoft Press, 2022. – 237 p.

5. Browne D. IBM Cognos Business Intelligence V10.1 Handbook / Dean Browne, Brecht Desmeijter, Rodrigo Frealdo Dumont, Armin Kamal and others // An IBM Redbooks publication, 2020. – 572 p.

6. Молчанов В. П. Технології розробки WEB-ресурсів [Електронний ресурс] : навч. посіб. / В. П. Молчанов, О. К. Пандорін ; Харківський національний економічний університет ім. С. Кузнеця. - Електрон. текстові дан. (7,94 МБ). - Харків : ХНЕУ ім. С. Кузнеця, 2019. - 129
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7. Табличний процесор MS EXCEL: просунутий рівень. Практикум [Електронний ресурс] / уклад. А. А. Гаврилова, Н. О. Бринза, О. Г. Король; Харківський національний економічний університет ім. С. Кузнеця. - Електрон. текстові дан. (7,92 МБ). - Харків: ХНЕУ ім. С. Кузнеця, 2021.
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Extra

9. Shmatko O. Information support for distributed teamwork knowledge management / O. Shmatko, M. Bilova. // Modern Problems Of Computer Science And IT-Education : collective monograph / [editorial board K. Melnyk, O. Shmatko].– Vienna : Premier Publishing s.r.o., 2020.– P. 169–192.
http://repository.hneu.edu.ua/handle/123456789/24818

10. Hryshchuk R. Construction methodology of information security system of banking information in automated banking systems : monograph / R. Hryshchuk, S. Yevseiev, A. Shmatko. – Vienna : Premier Publishing s. r. o., 2018. – 284 p.
http://repository.hneu.edu.ua/handle/123456789/21043

11. Power BI get started documentation електроний ресурс // https://learn.microsoft.com/pdf?url=https%3A%2F%2Flearn.microsoft.com%2Fen-us%2Fpower-bi%2Ffundamentals%2Ftoc.json

12. Transform, shape, and model data in Power BI – documentation електроний ресурс// https://learn.microsoft.com/pdf?url=https%3A%2F%2Flearn.microsoft.com%2Fen-us%2Fpower-bi%2Ftransform-model%2Ftoc.json

13. Microsoft Power BI - a suite of business intelligence tools to analyze data and provide valuable insights Access Mode : https://biconsult.com/products/microsoft-power-bi-nabor-sredstv-biznes-analitiki-dlya-analizadannyh-i-predostavleniya

Information resources

14. Site of personal educational systems of S. Kuznets Kh NEU in the discipline “ Business intelligence” https://pns.hneu.edu.ua/course/view.php?id=8970