

Module/Course Syllabus
Field of study: Computer Science
 Full-time study of the second degree

Course:	Application programming in PL/SQL language
Course type:	<i>elective</i>
Course code:	I2S2.16
Year:	I
Semester:	2
Form of the degree programme:	Full-time
Form of classes and number of hours per semester:	60
Lecture	30
Classes	0
Laboratory	30
Project	0
Number of ECTS credits:	4
Form of assessment:	Exam
Course language:	English

Course objectives	
C1	Gaining competencies enabling structured programming in PL/SQL.
C2	Gaining competencies enabling object-oriented programming in PL/SQL.

Prerequisites in terms of knowledge, skills and other competencies	
1	Database fundamentals and SQL
2	Structured and object-oriented programming
3	English language skills

Learning outcomes	
	In terms of knowledge:
LO 1	Student knows the structures and statements of the PL/SQL language enabling data processing with the use of structured programming techniques.
LO 2	Student knows the structures and statements of the PL/SQL language enabling data processing with the use of object-oriented programming techniques.
	In terms of skills:
LO 3	Student is able to apply the structures and statements of the PL/SQL language enabling data processing with the use of structured programming techniques.
LO 4	Student is able to apply the structures and statements of the PL/SQL language enabling data processing with the use of object-oriented programming techniques.
	In terms of social competencies:
LO 5	Student is able to think creatively while creating the PL/SQL code that implements the given functionality.
LO 6	Student understands the need for continuous development of programming competencies.

Course content	
Form of classes – lectures (L)	
	Curriculum content
L1	Classification of data types in PL / SQL, their purpose and mutual dependencies. Principles

	of naming lexical units. General characteristics of the PL/SQL language and areas of its applications. General structure of the PL/SQL block. Declarations of constants and scalar and complex variables.
L2	IF ... THEN ... ELSE, CASE conditional statements. LOOP, WHILE-LOOP, FOR-LOOP iterative statements. GOTO and NULL statements. Built-in PL / SQL functions. Character and number functions, data conversion, error management, etc. Built-in packages – types and areas of application.
L3	Cursors as a technique for processing a multiline data set. Classification of cursors. Data modification in tables with the use of cursors. Cursor variables for efficient data processing.
L4	Exceptions handling. Types and scope of exceptions. Declaring user-defined exceptions. Raising built-in and user-defined exceptions. Use of the RAISE_APPLICATION_ERROR procedure. Assigning exceptions to error numbers (PRAGMA EXCEPTION_INIT). Exception handling propagation.
L5	Collections and records as techniques for collecting and processing complex data. Types of collections and areas of their use. Declaring collections and ways to initialize them. Collection methods. Multidimensional collections. Declare a record type and record variable. Techniques of initializing the values of record variables. Use of a record type in collections.
L6	The object-oriented approach in an Oracle database and its implementation using the PL / SQL language. Defining an Object Type. Kinds of object-type methods and their implementation. Object type inheritance. Overriding methods. The use of objects in database tables and their processing in PL / SQL.
L7	PL/SQL subprograms – declaring and calling PL/SQL functions and procedures. Types of PL/SQL subprogram parameters. Parameter passing notations in PL/SQL subprogram calls. Pre-declaring PL/SQL subprograms. Overloading PL/SQL subprograms.
L8	Subprograms and packages stored in a database. Create functions and stored procedures. Create specification and package body in database. Management of stored subprograms and packages.
L9	Triggers as a technique for automating operations in a relational database. Types of triggers. Creating triggers and defining the PL/SQL code that implements their functionality. Autonomous transactions in trigger PL/SQL code.
L10	Dynamic PL/SQL – techniques for creating dynamic PL/SQL code, embedding it in a PL/SQL block and executing it. Using the DBMS_SQL package to perform operations with the use of dynamic PL/SQL code.
Form of classes – laboratories (Lab)	
	Curriculum content
Lab1	Defining PL/SQL blocks for data processing with the use of declarations of constants, variables and control statements in structured programming notation. Utilisation of control statements in data processing.
Lab2	Creation of explicit cursors and their use to process data retrieved from the database (OPEN, FETCH and CLOSE statements). The use of parameterised cursors. Use a cursor loop to process data from the cursor. The use of cursor variables in the dynamic definition of queries and processing their results.
Lab3	System exceptions handling. Declaring, raising, and handling user-defined exceptions. Using PRAGMA EXCEPTION_INIT to handle unnamed errors. Raising exceptions with the RAISE_APPLICATION_ERROR routine.
Lab4	Declaring a collection type and defining a collection. Initializing the collection by using a constructor and by substituting values. Application of collection methods in processing its elements. Defining multidimensional collections, their initialisation and processing of their elements. Declaring a record type and define a record variable. Initialising the field values of

	a record variable. Declaring a collection type using a record type. Processing collection items that are records.
Lab5	Creating an object type with no specification and with a specification in the database. Creating an object-type body. Defining member, static and constructor methods. Create tables with row objects and object columns. Data processing in PL/SQL using persistent and volatile objects.
Lab6	Defining and calling PL/SQL functions and procedures to manipulate data. The use of simple and complex data types as the result type of the PL/SQL subprograms. Nesting PL/SQL subprograms. Using packages embedded in PL/SQL subprograms.
Lab7	Creating procedures and functions stored in the database and defining their functionality in the PL/SQL code. Application of PL/SQL subprograms in stored subprograms. Compiling and calling stored subprograms. Create specification and package body. Use of PL/SQL subprograms in the package body. Compiling the package. Data processing in PL/SQL with the use of structures defined in the package.
Lab8	Creating triggers for INSERT, UPDATE and DELETE operations and handling events in PL/SQL code. Create standalone transactions for advanced event handling. Testing the correctness of the operation of triggers. Trigger management.
Lab9	Creating the dynamic SQL and PL/SQL code in a PL/SQL block and run it with EXECUTE IMMEDIATE statement. Use of bind variables in dynamic SQL and PL/SQL code. Data processing in PL/SQL block using DBMS_SQL package.

Didactic methods	
1	<i>Information lecture</i>
2	<i>Computer-based programming method: performing tasks defined by the teacher and using a given database, available on the e-learning platform</i>

Methods and criteria of evaluation		
Evaluation method code	Description of evaluation method	Passing threshold
E1	<i>Laboratory - credit in the form of solving tasks on a computer, randomly selected from a database on an e-learning platform.</i>	51%
E2	<i>Lecture - exam conducted in the form of a multiple-choice test conducted on an e-learning platform.</i>	51%

Required textbooks and other course materials	
1	McLaughlin Michael, <i>Oracle Database 12c. Programowanie w języku PL/SQL</i> . Gliwice, Wydawnictwo Helion, 2015
2	Forta Ben, <i>Oracle PL/SQL w mgnieniu oka: opanuj język zapytań w 10 minut dziennie</i> . Gliwice, Wydawnictwo Helion, 2020
Recommended textbooks and other course materials	
1	Oracle Help Center, <i>Database PL/SQL Language Reference</i> , https://docs.oracle.com/en/database/oracle/oracle-database/21/lnpls/
2	Oracle Help Center, <i>PL/SQL Packages and Types Reference</i> , https://docs.oracle.com/en/database/oracle/oracle-database/21/arpls/

Student workload	
Form of activity	Average number of hours to complete the activity
Contact hours with teacher, included:	60

<i>participation in lectures</i>	30
<i>participation in laboratories</i>	30
Student's own homework, included:	40
<i>preparation for the exam</i>	10
<i>preparation for the laboratory</i>	30
Total working time of the student	100
Total number of ECTS points for the course	4

Macierz efektów uczenia się					
Efekt uczenia się	Odniesienie danego efektu uczenia się do efektów zdefiniowanych dla kierunku studiów	Cele przedmiotu	Treści programowe	Metody dydaktyczne	Metody oceny
LO 1	I2A_W06 ++ I2A_W07 +++ I2A_W08 +++	CO1	L1 - L4, L7 - L10	1	A2
LO 2	I2A_W06 ++ I2A_W07 +++ I2A_W08 +++	CO1	L1, L2, L5, L6, L7, L10	1	A2
LO 3	I2A_U01 ++ I2A_U05 +++ I2A_U07 +++ I2A_U13 +++ I2A_U15 +++	CO2	Lab1, Lab2, Lab3, Lab6, Lab7, Lab8, Lab9	2	A1
LO 4	I2A_U01 ++ I2A_U05 +++ I2A_U07 +++ I2A_U13 +++ I2A_U15 +++	CO2	Lab4, Lab5, Lab6, Lab9	2	A1
LO 5	I2A_K02 ++	CO1, CO2	L1-L10 Lab2-Lab9	1, 2	A1, A2
LO 6	I2A_K01 ++	C1, C2	L1-L10 Lab2-Lab9	1, 2	O1, O2

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