#### UNIVERSITATEA TEHNICĂ DIN CLUJ-NAPOCA



### **SYLLABUS**

## 1. Data about the program of study

| 1.1 | Institution                    | The Technical University of Cluj-Napoca         |
|-----|--------------------------------|---|
| 1.2 | Faculty                        | Electronics, Telecommunications and Information |
|     | 1 actily                       | Technology                                      |
| 1.3 | Department                     | Communications                                  |
| 1.4 | Field of study                 | Electronics and Telecommunications Engineering  |
| 1.5 | Cycle of study                 | Master of Science                               |
| 1.6 | Program of study/Qualification | Telecommunications/Multimedia Technologies      |
| 1.7 | Form of education              | Full time                                       |
| 1.8 | Subject code                   | TC-E17.20                                       |

# 2. Data about the subject

| 2.1 | 1 Subject name |        |        |              | Data | Database Design and Programming       |                |          |          |                        |
|-----|----------------|--------|--------|--------------|------|---------------------------------------|----------------|----------|----------|------------------------|
| 2.2 | Subject area   |        |        |              |      | Elec                                  | ctronics and T | elecomn  | nunio    | cations Engineering    |
| 2.3 | Course respor  | nsible | e/lec  | turer        |      | Ass                                   | ociated Profe  | ssor Bog | dan      | ORZA, PhD              |
| 2.4 | Teachers in ch | narge  | e of a | applications | ,    | Associated Professor Bogdan ORZA, PhD |                |          |          |                        |
|     |                |        |        |              | Ass  | istant Profess                        | or Şerba       | n M      | EZA, PhD |                        |
| 2.5 | Year of study  | Ш      | 2.6    | Semester     | 1    | 2.7                                   | Assessment     | Exam     | 2.8      | Subject category DS/DO |

### 3. Estimated total time

| Year/ | Subject name                       | No.   | Course        | App | lication         | ons | Course | App | licati | ons      | Indiv. |     |   |
|-------|------------------------------------|-------|---------------|-----|------------------|-----|--------|-----|--------|----------|--------|-----|---|
| Sem.  |                                    | of    |               |     |                  |     |        |     | study  | <u> </u> | dits   |     |   |
|       |                                    | weeks | [hours/ week] |     | [hours/ semester |     |        |     | 0      | Credits  |        |     |   |
|       |                                    |       |               | S   | L                | Р   |        | S   | L      | Р        |        |     |   |
| II/1  | Database Design and<br>Programming | 14    | 2             | 0   | 1                | 0   |        |     |        |          | 58     | 100 | 4 |

| 3.1  | Number of hours per week          | 3      | 3.2       | of which, course    | 2     | 3.3      | applications | 1     |
|--|-----------------------------------|--------|-----------|---------------------|-------|----------|--------------|-------|
| 3.4  | Total hours in the curriculum     | 42     | 3.5       | of which, course    | 28    | 3.6      | applications | 14    |
|  |                                   |        |           |                     |       |          |              |       |
| Indivi   | dual study                        |        |           |                     |       |          |              | Hours |
| Manual, lecture material and notes, bibliography |                                   |        |           |                     |       |          |              | 20    |
| Supp   | lementary study in the library, c | nline  | and in th | ne field            |       |          |              | 20    |
| Prepa  | aration for seminars/laboratory   | works, | homew     | ork, reports, portf | olios | s, essay | S            | 15    |
| Tutor  | Tutoring                          |        |           |                     |       |          |              |       |
| Exams and tests                                  |                                   |        |           |                     |       |          |              | 3     |
| Othe   | activities                        |        |           |                     |       |          |              |       |

| 3.7 | Total hours of individual study | 58  |
|-----|---------------------------------|-----|
| 3.8 | Total hours per semester        | 100 |
| 3.9 | Number of credit points         | 4   |

# 4. Pre-requisites (where appropriate)

|   | 4.1 | Curriculum | Relational databases                           |  |  |
|---|-----|------------|--|--|--|
| ſ | 4.2 | Competence | General knowledge of the purpose of a database |  |  |
|   |     |            | High level knowledge of programming with SQL   |  |  |

## 5. Requirements (where appropriate)

| Ī | 5.1 | For the course       | Cluj-Napoca |
|---|-----|----------------------|-------------|
| Ī | 5.2 | For the applications | Cluj-Napoca |

## 6. Specific competences

# 7. Discipline objectives (as results from the key competences gained)

| 7.1 | General objectives  | Developing the competences regarding to design a database and use PL/SQL- Oracle's procedural extension language for SQL to extract data from an ORACLE Database  |
|-----|---------------------|---|
| 7.2 | Specific objectives | <ol> <li>Understanding how to analyze complex business scenarios, design and create data models and create databases using SQL,</li> <li>Developing skills to use Oracle SQL Developer Data Modeler and Oracle Application Express (APEX) in database design activities,</li> <li>Understanding programming with PL/SQL, Oracle's procedural extension language for SQL and the Oracle relational database,</li> <li>Understanding the differences between SQL and PL/SQL and exploring how PL/SQL is used to extend and automate SQL in administering the Oracle database,</li> <li>Developing skills and abilities to use ORACLE APEX to create applications using SQL and PL/SQL.</li> </ol> |

## 8. Contents

| 8.1. I | Lecture (syllabus)   | Teaching methods   | Notes                               |
|--------|--|--|-------------------------------------|
| 1      | Data modelling   | on,<br>vlem<br>xercise,<br>aluation  | ion,                                |
| 2      | <ul> <li>conceptual and physical models</li> <li>Logical model – Entity-Relationships Diagram ERD</li> <li>entities, instances, attributes and identifiers</li> <li>identifying relationships</li> <li>ERD conventions, ERD validations</li> <li>adding and using Data Types</li> <li>using Oracle SQL Developer Data Modeler for ERD</li> </ul> | Presentation,<br>uristic conversati<br>mplification, prob<br>ation, teaching e<br>dy, formative ev | e of .ppt presentation<br>projector |
| 3      | Normalizing ERD      about normalization     different form of normalization (1NF, 2NF, 3NF, others)   | heu<br>exel<br>present<br>case stu   | Use                                 |

| 4 Transforming logical model to a relational design  • Mapping ERD to a Relational Database Design  • Analyzing Relational Model  • Denormalizing Relational Design  • Physical models  • Generating Database  5 Oracle Application Express - SQL Workshop  • Managing Database Objects  • Using SQL Commands tool  • Using SQL Scripts  • Using APEX utilities – data workshop, generating DDL, managing methods on tables, using query builder, monitoring database  6 Introduction to PL/SQL  • Benefits of PL/SQL  • Defining variable in PL/SQL  • Interacting with Database server – using SQL in PL/SQL  • Wrifting control structures  • Working with composite data types  • Using cursors and parameters  • Handling exceptions  8 Using and managing procedures  • using parameters in procedures  • using parameters in procedures  • using parameters in procedures  • using and managing putctions  • creating functions  • creating functions  10 Using and managing procedures and functions  10 Using and man | 8.1. L | ecture (syllabus)                                   | Teaching methods                           | Notes                      |
|--|--------|---|--|----------------------------|
| Analyzing Relational Model     Denormalizing Relational Design     Physical models     Generating Database     Generating Database Oracle Application Express - SQL Workshop     Managing Database Objects     Using SQL Commands tool     Using SQL Commands tool     Using SQL Scripts     Using APEX utilities — data workshop, generating DDL, managing methods on tables, using query builder, monitoring database  for Introduction to PL/SQL     Defining variable in PL/SQL     Defining variable in PL/SQL     Interacting with Database server — using SQL in PL/SQL     Working with composite data types     Using cursors and parameters     Working with composite data types     Using and managing procedures     veating procedures     veating procedures     veating procedures     veating functions     veating functions     veating procedures     veating procedures     veating procedures     veating functions     veating functions     veating procedures     veati      | 4      |   |  |                            |
| Denormalizing Relational Design Physical models Generating Database Generating Database Oracle Application Express - SQL Workshop Managing Database Objects Using SQL Commands tool Using SQL Commands tool Using SQL Scripts Using APEX utilities – data workshop, generating DDL, managing methods on tables, using query builder, monitoring database  Introduction to PL/SQL Defining variable in PL/SQL Defining variable in PL/SQL Writing control structures Working with composite data types Using action of tructures Working with composite data types Using quersors and parameters Handling exceptions Using and managing procedures creating procedures using functions using functions in SQL statements managing procedures creating procedures using functions using functions in SQL statements managing procedures creating procedures  |        |   |  |                            |
| Physical models Generating Database Generating Database Objects Using SQL Commands tool Using SQL Commands tool Using SQL Commands tool Using SQL Commands tool Using SQL Scripts Using APEX Utilities — data workshop, generating DDL, managing methods on tables, using query builder, monitoring database Introduction to PL/SQL Benefits of PL/SQL Defining variable in PL/SQL Writing control structures Working with Database server — using SQL in PL/SQL Working with composite data types Using cursors and parameters Handling exceptions Using and managing procedures creating procedures using parameters in procedures passing parameters Using and managing functions creating functions creating functions creating packages creating packages managing procedures and functions using functions in SQL statements managing procedures and functions creating packages managing package concepts using Oracle PL/SQL packages improving PL/SQL packages managing package concepts using Oracle PL/SQL packages managing thyders creating DDL and database event triggers integrating media objects in APEX – images, graphics, map chart, embedded multimedia object APEX reports APEX reports APEX reports APEX reports APEX reports APEX reports Using JavaScript, HTML5 and CSS3 to APEX application Publishing from APEX – export CSV, PDF, using Oracle BI Publisher APEX froms Using JavaScript, HTML5 and CSS3 to APEX application Publishing from APEX – export CSV, PDF, using Oracle BI Publisher APEX froms Using JavaScript, HTML5 and CSS3 to APEX application Publishing from APEX – export CSV, PDF, using Oracle BI Publisher APEX froms Using JavaScript, HTML5 and CSS3 to APEX application Publishing from APEX – export CSV, PDF, using Oracle BI Publisher APEX froms Using JavaScript, HTML5 and CSS3 to APEX application APEX froms AP |        | , ,   |  |                            |
| Cenerating Database  Oracle Application Express - SGL Workshop  Managing Database Objects  Using SQL Commands tool  Using SQL Scripts  Using APEX utilities - data workshop, generating DDL, managing methods on tables, using query builder, monitoring database  Introduction to PL/SQL  Defining variable in PL/SQL  Defining variable in PL/SQL  Writing control structures  Working with composite data types  Using and managing procedures  Using and managing procedures  using parameters in procedures  using and managing procedures  using and managing procedures  using and managing procedures  using functions in SQL statements  managing procedures and functions  Using and managing packages  creating package concepts  using Oracle PL/SQL performance  10 Using and managing packages  creating DDL and database event triggers  managing procedures and functions  11 Using and managing triggers  creating DDL and database event triggers  managing package concepts  integrating media objects in APEX – images, graphics, map chart, embedded multimedia object  Authentication options  13 Oracle Application Express – creating application 1  Application types  APEX (reports)  Integrating media objects in APEX – images, graphics, map chart, embedded multimedia object  Authentication options  13 Oracle Application Express – creating application 2  Navigation bar and menus  APEX forms  Using JavaScript, HTML5 and CSS3 to APEX application  Publishing from APEX – export CSV, PDF, using Oracle BI Publisher  Recapitulation. Preparation for the final exam.  Notes  Processory of the process of the final exam.  Notes  Apelication company of the final exam.  Notes  Processory of the process of the final exam.  Notes  Processory of the process of the final exam.  Notes  Processory of the process of the final exam.  Notes  Processory of the process of the process of the processor of  |        |   |  |                            |
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| Managing Database Objects  Using SQL Commands tool Using SQL Scripts  Using APEX utilities – data workshop, generating DDL, managing methods on tables, using query builder, monitoring database  Introduction to PU/SQL Benefits of PU/SQL Benefits of PU/SQL Benefits of PU/SQL Defining variable in PU/SQL Writing control structures Working with composite data types Working with composite data types Using and managing procedures Final ding exceptions  Using and managing procedures Greating procedures Greating procedures Greating functions Great  | 5      |   |  |                            |
| Using SQL Commands tool Using SQL Scripts Using APEX utilities – data workshop, generating DDL, managing methods on tables, using query builder, monitoring database Introduction to PL/SQL Benefits of PL/SQL Defining variable in PL/SQL Using arbate in PL/SQL Writing control structures Working with PL/SQL Writing control structures Working with composite data types Using and managing procedures Cereating procedures Using parameters in procedures cereating procedures cereating procedures cereating functions using functions in SQL statements managing procedures and functions using functions in SQL statements managing procedures and functions using functions in SQL statements managing procedures and functions using functions in SQL statements managing procedures and functions using functions in SQL statements cereating packages creating packages managing packages creating packages creating packages creating packages creating packages creating DML triggers creating DML procedures packages managing triggers creating packages and managing triggers creating DML procedures paper triggers managing triggers creating DML triggers creating  |        |   |  |                            |
| Using SQL Scripts     Using APEX utilities – data workshop, generating DDL, managing methods on tables, using query builder, monitoring database  Introduction to PL/SQL     Benefits of PL/SQL     Benefits of PL/SQL     Defining variable in PL/SQL     Interacting with Database server – using SQL in PL/SQL  7 Programming with PL/SQL     Writing control structures     Working with composite data types     Working with composite data types     Using and managing procedures     Using and managing procedures     using parameters in procedures     using parameters in procedures     using parameters in procedures     using parameters or creating procedures     using parameters in procedures     using parameters  9 Using and managing functions     creating packages     creating packages     creating packages     creating packages     managing procedures and functions  10 Using and managing packages     managing procedures and functions  11 Using and managing triggers     creating DNL triggers     creating DNL backages     improving PL/SQL packages     improving PL/SQL packa      |        |   |  |                            |
| Sing APEX utilities – data workshop, generating DDL, managing methods on tables, using query builder, monitoring database  |        |   |  |                            |
| Introduction to PL/SQL   |        | · · · · · · · · · · · · · · · · · · ·               |  |                            |
| Benefits of PL/SQL Defining variable in PL/SQL Interacting with Database server – using SQL in PL/SQL  7 Programming with PL/SQL Writing control structures Working with composite data types Using cursors and parameters Handling exceptions  8 Using and managing procedures using parameters in procedures using parameters in procedures using parameters in procedures using functions creating functions creating functions using functions in SQL statements managing procedures and functions creating packages managing procedures and functions  10 Using and managing packages managing packages managing packages improving PL/SQL packages improving PL/SQL performance  11 Using and managing triggers creating DML triggers creating DML triggers creating DML and database event triggers managing triggers  12 Oracle Application Express – creating application 1 Application types APEX reports Integrating media objects in APEX – images, graphics, map chart, embedded multimedia object Authentication options  13 Oracle Application Express – creating application 2 Navigation bar and menus APEX forms Using JavaScript, HTML5 and CSS3 to APEX application Publishing from APEX – export CSV, PDF, using Oracle BI Publisher  14 Recapitulation. Preparation for the final exam.  8.2 Applications (lab)  Teaching methods  Notes methods  Notes  Teaching methods  Notes  1 Introduction – creating APEX account, install ORACLE tools, presenting the practical activity  2 Logical model – Entity-Relationships Diagram ERD  3 Normalizing ERD  4 Transforming logical model to a relational design  |        |   |  |                            |
| Defining variable in PL/SQL Interacting with Database server – using SQL in PL/SQL  Programming with PL/SQL  Writing control structures Working with composite data types Using cursors and parameters Handling exceptions  Using and managing procedures creating procedures passing parameters passing parameters using parameters using functions creating functions creating functions using functions in SQL statements managing procedures and functions using and managing packages managing packages managing packages managing packages managing packages managing procedures and functions  Using and managing packages managing procedures and functions  Using and managing packages managing triggers creating DDL and database event triggers managing triggers creating DDL and database event triggers managing triggers creating DDL and database event triggers managing triggers  12 Oracle Application Express – creating application 1 Application types APEX reports Integrating media object in APEX – images, graphics, map chart, embedded multimedia object Authentication options  13 Oracle Application Express – creating application 2 Navigation bar and menus APEX forms Using JavaScript, HTML5 and CSS3 to APEX application Publishing from APEX – export CSV, PDF, using Oracle BI Publisher  14 Recapitulation. Preparation for the final exam.  Recapitulation. Preparation for the final exam.  Notes  Teaching methods  Introduction – creating APEX account, install ORACLE tools, presenting the practical activity Description of the final exam.  Notes  Teaching methods  Teaching T  | 6      |   |  |                            |
| Interacting with Database server – using SQL in PL/SQL  Programming with PL/SQL  Writing control structures  Working with composite data types  Using cursors and parameters  Handling exceptions  Using and managing procedures  creating procedures  creating procedures  passing parameters  Using and managing functions  creating functions  creating functions  using functions in SQL statements  managing procedures and functions  creating packages  managing procedures and functions  using oracle PL/SQL performance  Using and managing packages  managing packages  improving PL/SQL performance  Using and managing friggers  creating DML triggers  creating DML triggers  creating DML performance  Integrating media objects in APEX – images, graphics, map chart,  embedded multimedia object  AUthentication options  Toracle Application Express – creating application 1  APEX forms  Using JavaScript, HTML5 and CSS3 to APEX application  APEX forms  Using JavaScript, HTML5 and CSS3 to APEX application  Publishing from APEX – export CSV, PDF, using Oracle BI Publisher  Recapitulation, Preparation for the final exam.  Logical model – Entity-Relationships Diagram ERD  Notes  Introduction – creating APEX account, install ORACLE tools, presenting the practical activity  Logical model – Entity-Relationships Diagram ERD  Normalizing ERD  Teaching methods  |        |   |  |                            |
| 7 Programming with PL/SQL  • Writing control structures  • Working with composite data types  • Using cursors and parameters  • Handling exceptions  8 Using and managing procedures  • creating procedures  • using parameters in procedures  • passing parameters  9 Using and managing functions  • creating functions  • using functions in SQL statements  • managing procedures and functions  10 Using and managing procedures and functions  11 Using and managing packages  • creating packages  • managing package concepts  • using Oracle PL/SQL packages  • improving PL/SQL packages  • improving PL/SQL packages  • improving PL/SQL packages  • analyting package concepts  • creating DDL and database event triggers  • creating DDL and database event triggers  • creating DDL and database event triggers  • application types  • APEX reports  • Integrating media objects in APEX – images, graphics, map chart,  • embedded multimedia object  • Authentication options  13 Oracle Application Express – creating application 2  • Navigation bar and menus  • APEX forms  • Using JavaScript, HTML5 and CSS3 to APEX application  • Publishing from APEX – export CSV, PDF, using Oracle BI Publisher  14 Recapitulation. Preparation for the final exam.  8.2. Applications (lab)  1 Introduction – creating APEX account, install ORACLE tools, presenting the practical activity  2 Logical model – Entity-Relationships Diagram ERD  3 Normalizing ERD  4 Transforming logical model to a relational design   |        | 1   |  |                            |
| Writing control structures Working with composite data types Using cursors and parameters Handling exceptions  Using and managing procedures creating procedures using parameters using parameters Using and managing functions creating functions using functions using functions using functions creating procedures and functions using functions using packages creating packages creating packages improving PL/SQL packages improving PL/SQL performance  Using and managing triggers creating DNL triggers creating DNL triggers creating DNL triggers creating DNL and database event triggers ananging triggers  Paper Square  Tarafix forms Using and managing triggers creating DNL and database event triggers ananging triggers  Toracle Application Express – creating application 1 Application types APEX reports Integrating media objects in APEX – images, graphics, map chart, embedded multimedia object Authentication options  Toracle Application Express – creating application 2 Navigation bar and menus APEX forms Using JavaScript, HTML5 and CSS3 to APEX application Publishing from APEX – export CSV, PDF, using Oracle BI Publisher  Recapitulation. Preparation for the final exam.  Logical model – Entity-Relationships Diagram ERD Notes Teaching methods  Notes Teaching methods  | 7      |   |  |                            |
| Working with composite data types Using cursors and parameters Handling exceptions Using and managing procedures using parameters in procedures using parameters Using and managing procedures using parameters Using and managing functions creating functions creating functions using functions in SQL statements managing procedures and functions using functions in SQL statements managing procedures and functions using gand managing packages creating packages managing packages managing packages creating packages creating packages managing PL/SQL performance Using and managing triggers creating DDL and database event triggers creating DDL and database event triggers creating DDL and database event triggers creating Application Express – creating application 1 Application types APEX reports Integrating media objects in APEX – images, graphics, map chart, embedded multimedia object Authentication options  13 Oracle Application Express – creating application 2 Navigation bar and menus APEX forms Using JavaScript, HTML5 and CSS3 to APEX application Publishing from APEX – export CSV, PDF, using Oracle BI Publisher  14 Recapitulation. Preparation for the final exam.  15 Logical model – Entity-Relationships Diagram ERD  16 Normalizing ERD  17 Introduction – creating APEX account, install ORACLE tools, presenting the practical activity Logical model – Entity-Relationships Diagram ERD  3 Normalizing ERD  4 Transforming logical model to a relational design  | '      |   |  |                            |
| Using cursors and parameters Handling exceptions  Using and managing procedures creating procedures using parameters passing parameters using parameters using functions creating functions creating functions using functions using functions in SQL statements managing procedures and functions  creating parameters using functions using functions creating parameters using functions using functions using functions creating packages creating packages improving PL/SQL packages improving PL/SQL packages improving PL/SQL packages improving PL/SQL packages creating DML triggers creating DML and database event triggers creating DML and database event triggers creating DNL and database event triggers APEX reports Integrating media objects in APEX – images, graphics, map chart, embedded multimedia object Authentication options  Toracle Application Express – creating application 2 Navigation bar and menus APEX forms Using JavaScript, HTML5 and CSS3 to APEX application Publishing from APEX – export CSV, PDF, using Oracle BI Publisher  ARecapitulation. Preparation for the final exam.  Teaching methods  Transforming logical model to a relational design   |        |   |  |                            |
| B Using and managing procedures  |        | , ,,  |  |                            |
| Using and managing procedures   creating procedures   using parameters   passing parameters     Using and managing functions   creating functions   using procedures and functions     Using and managing packages   managing packages   managing packages   managing package   using Oracle PL/SQL packages   improving PL/SQL performance     Using and managing triggers   creating DDL and database event triggers   creating DDL triggers   error oracle Application Express - creating application 1   Application types   APEX reports   Integrating media objects in APEX - images, graphics, map chart,   embedded multimedia object   Authentication options     Oracle Application Express - creating application 2   Navigation baar and menus   APEX forms   Using JavaScript, HTML5 and CSS3 to APEX application   APEX forms   Using JavaScript, HTML5 and CSS3 to APEX application   Publishing from APEX - export CSV, PDF, using Oracle BI Publisher   Teaching methods   Publishing from APEX - export CSV, PDF, using Oracle BI Publisher   Teaching methods   Publishing from APEX - export CSV, PDF, using Oracle BI Publisher   Teaching methods   Publishing from APEX - export CSV, PDF, using Oracle BI Publisher   Teaching methods   Publishing from APEX - export CSV, PDF, using Oracle BI Publisher   Teaching methods   Publishing from APEX - export CSV, PDF, using Oracle BI Publisher   Teaching methods   Publishing from APEX - export CSV, PDF, using Oracle BI Publisher   Teaching methods   Publishing from APEX - export CSV, PDF, using Oracle BI Publisher   Teaching methods   Publishing from APEX - export CSV, PDF, using Oracle BI Publisher   Teaching methods   Publishing from APEX - export CSV, PDF, using Oracle BI Publisher   Teaching methods   Popularion   Publishing from APEX - export CSV, PDF, using Oracle BI Publisher   Publishing from APEX - export CSV, PDF, using Oracle BI Publisher   Publishing f   |        | ·   |  |                            |
| creating procedures     using parameters     passing parameters  9 Using and managing functions     creating functions    using functions    using functions    using functions  | 8      |   |  |                            |
| using parameters in procedures     passing parameters  9 Using and managing functions     creating functions     using functions in SQL statements     managing procedures and functions  10 Using and managing packages     creating packages     creating packages     improving PL/SQL packages     improving PL/SQL performance  11 Using and managing triggers     creating DDL and database event triggers     integrating media objects in APEX – images, graphics, map chart,     embedded multimedia object     Authentication options  13 Oracle Application Express – creating application 2     Navigation bar and menus     APEX forms     Using JavaScript, HTML5 and CSS3 to APEX application     Publishing from APEX – export CSV, PDF, using Oracle BI Publisher  14 Recapitulation. Preparation for the final exam.  8.2 Applications (lab)  Teaching methods  Notes  Notes  Notes  1 Introduction – creating APEX account, install ORACLE tools, presenting the practical activity  2 Logical model – Entity-Relationships Diagram ERD  Normalizing ERD  Transforming logical model to a relational design  |        |   |  |                            |
| 9 Using and managing functions • creating functions • using functions in SQL statements • managing procedures and functions  10 Using and managing packages • creating packages • managing packages • managing package concepts • using Oracle PL/SQL packages • improving PL/SQL performance  11 Using and managing triggers • creating DDL and database event triggers • creating DDL and database event triggers • managing triggers  12 Oracle Application Express – creating application 1 • Application types • APEX reports • Integrating media objects in APEX – images, graphics, map chart, • embedded multimedia object • Authentication options  13 Oracle Application Express – creating application 2 • Navigation bar and menus • APEX forms • Using JavaScript, HTML5 and CSS3 to APEX application • Publishing from APEX – export CSV, PDF, using Oracle BI Publisher  14 Recapitulation. Preparation for the final exam.  8.2. Applications (lab)  1 Introduction – creating APEX account, install ORACLE tools, presenting the practical activity  2 Logical model – Entity-Relationships Diagram ERD  3 Normalizing ERD  4 Transforming logical model to a relational design   |        |   |  |                            |
| creating functions         using functions in SQL statements         managing procedures and functions  10 Using and managing packages         creating packages         using Oracle PL/SQL packages         improving PL/SQL performance  11 Using and managing triggers         creating DML triggers         creating DDL and database event triggers         error oracle Application Express – creating application 1         Application types         APEX reports         Integrating media objects in APEX – images, graphics, map chart,         embedded multimedia object         Authentication options         Oracle Application Express – creating application 2         Navigation bar and menus         APEX forms         Using JavaScript, HTML5 and CSS3 to APEX application         Publishing from APEX – export CSV, PDF, using Oracle BI Publisher  14 Recapitulation. Preparation for the final exam.  8.2. Applications (lab)  1 Introduction – creating APEX account, install ORACLE tools, presenting the practical activity  2 Logical model – Entity-Relationships Diagram ERD         A Normalizing ERD         A Transforming logical model to a relational design   |        | passing parameters                                  |  |                            |
| using functions in SQL statements     managing procedures and functions  10 Using and managing packages     creating packages     managing package concepts     using Oracle PL/SQL packages     improving PL/SQL performance  11 Using and managing triggers     creating DML triggers     creating DML triggers     creating DDL and database event triggers     creating DDL and database event triggers     Application Express – creating application 1     Application types     APEX reports     Integrating media objects in APEX – images, graphics, map chart,     embedded multimedia object     Authentication options  13 Oracle Application Express – creating application 2     Navigation bar and menus     APEX forms     Using JavaScript, HTML5 and CSS3 to APEX application     Publishing from APEX – export CSV, PDF, using Oracle BI Publisher  14 Recapitulation. Preparation for the final exam.  8.2. Applications (lab)  1 Introduction – creating APEX account, install ORACLE tools, presenting the practical activity  2 Logical model – Entity-Relationships Diagram ERD     Normalizing ERD  4 Transforming logical model to a relational design   | 9      |   |  |                            |
| managing procedures and functions  10 Using and managing packages  |        |   |  |                            |
| 10 Using and managing packages   |        |   |  |                            |
| creating packages     managing package concepts     using Oracle PL/SQL packages     improving PL/SQL performance  11 Using and managing friggers     creating DML triggers     creating DDL and database event triggers     managing triggers     managing triggers  12 Oracle Application Express – creating application 1     Application types     APEX reports     Integrating media objects in APEX – images, graphics, map chart,     embedded multimedia object     Authentication options  13 Oracle Application Express – creating application 2     Navigation bar and menus     APEX forms     Using JavaScript, HTML5 and CSS3 to APEX application     Publishing from APEX – export CSV, PDF, using Oracle BI Publisher  14 Recapitulation. Preparation for the final exam.  8.2. Applications (lab)  1 Introduction – creating APEX account, install ORACLE tools, presenting the practical activity  2 Logical model – Entity-Relationships Diagram ERD     Normalizing ERD  4 Transforming logical model to a relational design   | 40     |   |  |                            |
| <ul> <li>managing package concepts</li> <li>using Oracle PL/SQL packages</li> <li>improving PL/SQL performance</li> <li>Using and managing triggers</li> <li>creating DML triggers</li> <li>creating DDL and database event triggers</li> <li>managing triggers</li> <li>Oracle Application Express – creating application 1</li> <li>Application types</li> <li>APEX reports</li> <li>Integrating media objects in APEX – images, graphics, map chart,</li> <li>embedded multimedia object</li> <li>Authentication options</li> <li>Oracle Application Express – creating application 2</li> <li>Navigation bar and menus</li> <li>APEX forms</li> <li>Using JavaScript, HTML5 and CSS3 to APEX application</li> <li>Publishing from APEX – export CSV, PDF, using Oracle BI Publisher</li> <li>Recapitulation. Preparation for the final exam.</li> <li>8.2. Applications (lab)</li> <li>Introduction – creating APEX account, install ORACLE tools, presenting the practical activity</li> <li>Logical model – Entity-Relationships Diagram ERD</li> <li>Notes</li> <li>Teaching methods</li> <li>Introduction – Creating APEX account, install ORACLE tools, presenting the practical activity</li> <li>Logical model – Entity-Relationships Diagram ERD</li> <li>Normalizing ERD</li> <li>Transforming logical model to a relational design</li> </ul>  | 10     |   |  |                            |
| using Oracle PL/SQL packages     improving PL/SQL performance  11 Using and managing triggers     creating DML triggers     creating DDL and database event triggers     managing triggers  12 Oracle Application Express – creating application 1     Application types     APEX reports     Integrating media objects in APEX – images, graphics, map chart,     embedded multimedia object     Authentication options  13 Oracle Application Express – creating application 2     Navigation bar and menus     APEX forms     Using JavaScript, HTML5 and CSS3 to APEX application     Publishing from APEX – export CSV, PDF, using Oracle BI Publisher  14 Recapitulation. Preparation for the final exam.  8.2. Applications (lab)  1 Introduction – creating APEX account, install ORACLE tools, presenting the practical activity 2 Logical model – Entity-Relationships Diagram ERD 3 Normalizing ERD 4 Transforming logical model to a relational design   |        |   |  |                            |
| Improving PL/SQL performance   |        |   |  |                            |
| 11 Using and managing triggers   |        |   |  |                            |
| <ul> <li>creating DML triggers</li> <li>creating DDL and database event triggers</li> <li>managing triggers</li> <li>12 Oracle Application Express – creating application 1 <ul> <li>Application types</li> <li>APEX reports</li> <li>Integrating media objects in APEX – images, graphics, map chart,</li> <li>embedded multimedia object</li> <li>Authentication options</li> </ul> </li> <li>13 Oracle Application Express – creating application 2 <ul> <li>Navigation bar and menus</li> <li>APEX forms</li> <li>Using JavaScript, HTML5 and CSS3 to APEX application</li> <li>Publishing from APEX – export CSV, PDF, using Oracle BI Publisher</li> </ul> </li> <li>14 Recapitulation. Preparation for the final exam.</li> <li>8.2. Applications (lab)</li> <li>Introduction – creating APEX account, install ORACLE tools, presenting the practical activity</li> <li>Logical model – Entity-Relationships Diagram ERD</li> <li>Normalizing ERD</li> <li>Transforming logical model to a relational design</li> </ul>   | 11     |   |  |                            |
| <ul> <li>creating DDL and database event triggers</li> <li>managing triggers</li> <li>Oracle Application Express – creating application 1</li> <li>Application types</li> <li>APEX reports</li> <li>Integrating media objects in APEX – images, graphics, map chart,</li> <li>embedded multimedia object</li> <li>Authentication options</li> <li>Oracle Application Express – creating application 2</li> <li>Navigation bar and menus</li> <li>APEX forms</li> <li>Using JavaScript, HTML5 and CSS3 to APEX application</li> <li>Publishing from APEX – export CSV, PDF, using Oracle BI Publisher</li> <li>Recapitulation. Preparation for the final exam.</li> <li>Applications (lab)</li> <li>Introduction – creating APEX account, install ORACLE tools, presenting the practical activity</li> <li>Logical model – Entity-Relationships Diagram ERD</li> <li>Normalizing ERD</li> <li>Transforming logical model to a relational design</li> </ul>  |        |   |  |                            |
| <ul> <li>managing triggers</li> <li>Oracle Application Express – creating application 1         <ul> <li>Application types</li> <li>APEX reports</li> <li>Integrating media objects in APEX – images, graphics, map chart,</li> <li>embedded multimedia object</li> <li>Authentication options</li> </ul> </li> <li>Oracle Application Express – creating application 2         <ul> <li>Navigation bar and menus</li> <li>APEX forms</li> <li>Using JavaScript, HTML5 and CSS3 to APEX application</li> <li>Publishing from APEX – export CSV, PDF, using Oracle BI Publisher</li> </ul> </li> <li>Recapitulation. Preparation for the final exam.</li> <li>Applications (lab)</li> <li>Introduction – creating APEX account, install ORACLE tools, presenting the practical activity</li> <li>Logical model – Entity-Relationships Diagram ERD</li> <li>Normalizing ERD</li> <li>Transforming logical model to a relational design</li> </ul>  |        |   |  |                            |
| Application types     APEX reports     Integrating media objects in APEX – images, graphics, map chart,     embedded multimedia object     Authentication options  13 Oracle Application Express – creating application 2     Navigation bar and menus     APEX forms     Using JavaScript, HTML5 and CSS3 to APEX application     Publishing from APEX – export CSV, PDF, using Oracle BI Publisher  14 Recapitulation. Preparation for the final exam.  8.2. Applications (lab)  1 Introduction – creating APEX account, install ORACLE tools, presenting the practical activity  2 Logical model – Entity-Relationships Diagram ERD  3 Normalizing ERD  4 Transforming logical model to a relational design   |        |   |  |                            |
| APEX reports     Integrating media objects in APEX – images, graphics, map chart,     embedded multimedia object     Authentication options  13 Oracle Application Express – creating application 2     Navigation bar and menus     APEX forms     Using JavaScript, HTML5 and CSS3 to APEX application     Publishing from APEX – export CSV, PDF, using Oracle BI Publisher  14 Recapitulation. Preparation for the final exam.  8.2. Applications (lab)  1 Introduction – creating APEX account, install ORACLE tools, presenting the practical activity  2 Logical model – Entity-Relationships Diagram ERD  3 Normalizing ERD  4 Transforming logical model to a relational design   | 12     | Oracle Application Express – creating application 1 |  |                            |
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| embedded multimedia object     Authentication options  13 Oracle Application Express – creating application 2     Navigation bar and menus     APEX forms     Using JavaScript, HTML5 and CSS3 to APEX application     Publishing from APEX – export CSV, PDF, using Oracle BI Publisher  14 Recapitulation. Preparation for the final exam.  8.2. Applications (lab)  1 Introduction – creating APEX account, install ORACLE tools, presenting the practical activity  2 Logical model – Entity-Relationships Diagram ERD  3 Normalizing ERD  4 Transforming logical model to a relational design   |        |   |  |                            |
| Authentication options  Oracle Application Express – creating application 2     Navigation bar and menus     APEX forms     Using JavaScript, HTML5 and CSS3 to APEX application     Publishing from APEX – export CSV, PDF, using Oracle BI Publisher  Recapitulation. Preparation for the final exam.  8.2. Applications (lab)  Introduction – creating APEX account, install ORACLE tools, presenting the practical activity  Logical model – Entity-Relationships Diagram ERD  Normalizing ERD  Teaching methods  Notes  Notes  Notes  Teaching methods  Notes  Teaching methods  Notes  To o o o o o o o o o o o o o o o o o o  |        |   |  |                            |
| 13 Oracle Application Express – creating application 2  • Navigation bar and menus • APEX forms • Using JavaScript, HTML5 and CSS3 to APEX application • Publishing from APEX – export CSV, PDF, using Oracle BI Publisher  14 Recapitulation. Preparation for the final exam.  8.2. Applications (lab)  1 Introduction – creating APEX account, install ORACLE tools, presenting the practical activity  2 Logical model – Entity-Relationships Diagram ERD 3 Normalizing ERD 4 Transforming logical model to a relational design   |        |   |  |                            |
| Navigation bar and menus     APEX forms     Using JavaScript, HTML5 and CSS3 to APEX application     Publishing from APEX – export CSV, PDF, using Oracle BI Publisher  14 Recapitulation. Preparation for the final exam.  8.2. Applications (lab)  Introduction – creating APEX account, install ORACLE tools, presenting the practical activity  2 Logical model – Entity-Relationships Diagram ERD  3 Normalizing ERD  4 Transforming logical model to a relational design   | 40     |   |  |                            |
| APEX forms     Using JavaScript, HTML5 and CSS3 to APEX application     Publishing from APEX – export CSV, PDF, using Oracle BI Publisher    Recapitulation. Preparation for the final exam.   | 13     |   |  |                            |
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| Publishing from APEX – export CSV, PDF, using Oracle BI Publisher  Recapitulation. Preparation for the final exam.  8.2. Applications (lab)  Introduction – creating APEX account, install ORACLE tools, presenting the practical activity  Logical model – Entity-Relationships Diagram ERD  Normalizing ERD  Teaching methods  Publisher  Void of the final exam.  Notes  Notes  Notes  A publisher  Teaching methods  Publisher  Notes  Notes  A publisher  Teaching methods  Publisher  Notes  A publisher  Teaching methods  Publisher  Notes   |        |   |  |                            |
| 14   Recapitulation. Preparation for the final exam.   |        |   |  |                            |
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| practical activity  2 Logical model – Entity-Relationships Diagram ERD  3 Normalizing ERD  4 Transforming logical model to a relational design   |        |   |  |                            |
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| 3 Normalizing ERD  4 Transforming logical model to a relational design  5 Oracle Application Express - SQL Workshop  | 2      |   | c all<br>nen<br>hen<br>yf,<br>xtic<br>ise, | of<br>Itor<br>ter:<br>etic |
| 4 Transforming logical model to a relational design  |        |   | ictii<br>roc<br>roc<br>dac<br>arci         | lse<br>ora<br>npu<br>ign   |
| 5 Oracle Application Express - SQL Workshop  |        |   | ida<br>xpe<br>di<br>exe                    | U<br>lab<br>ior<br>ma<br>b |
| O JORGO APPROGRAM EXPROSO COLETTORIONO   | 5      | Oracle Application Express - SQL Workshop           | □ <b>6</b>                                 | _ 0                        |

| 8.1. L | Lecture (syllabus)                                  | Teaching methods | Notes |
|--------|---|------------------|-------|
| 6      | Introduction to PL/SQL                              |                  |       |
| 7      | Programming with PL/SQL                             |                  |       |
| 8      | Using and managing procedures                       |                  |       |
| 9      | Using and managing functions                        |                  |       |
| 10     | Using and managing packages                         |                  |       |
| 11     | Using and managing triggers                         |                  |       |
| 12     | Oracle Application Express – creating application 1 |                  |       |
| 13     | Oracle Application Express – creating application 2 |                  |       |
| 14     | Lab recovery and finalization of project activity   |                  |       |

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- 1. R.K. Stephens, R.R. Plew Database design, 2001 Sams Publishing, 0-672-31758-3
- 2. T. Connolly, C. Begg Database solutions, 2004 Addison Wesley, 0-321-17350-3
- 3. B. Rosenzweig, E. Rakhimov Oracle PL/SQL by example, 2008 Addison Wesley, 0-137-14422-9
- 4. M.Plas, M. Zoest Oracle APEX Cookbook, 2013 Packt Publishing, 978-1-78217-967-2

#### On-line references

- 1. B. ORZA, Database Design and Programming. Technical University of Cluj-Napoca, 2016 available on O365 portal, in Class Notebook section <a href="https://portal.office.com/">https://portal.office.com/</a>
- 9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

Competences acquired will be used in the following COR occupations (Electronics Engineer; Telecommunications Engineer; Electronics Design Engineer; System and Computer Design Engineer; Communications Design Engineer) or in the new occupations proposed to be included in COR (Sale Support Engineer; Multimedia Applications Developer; Network Engineer; Communications Systems Test Engineer; Project Manager; Traffic Engineer; Communications Systems Consultant).

#### 10. Evaluations

| Activity type                               | 10.1 | Assessment criteria  | 10.2 | Assessment methods  | 10.3 | Weight in the final grade                            |
|---|------|--|------|---|------|--|
| Course                                      |      | The level of acquired theoretical knowledge and practical skills |      | - 2 summative<br>evaluation tests (theory<br>and exercises)               |      | - E1, max 10 pts.<br>20%<br>- E2, max 10 pts.<br>20% |
| Applications                                |      | The level of acquired abilities                                  |      | - Continuous formative<br>evaluation – laboratory<br>activity portfolio L |      | - L, max. 10 pts.<br>20%                             |
|   |      |  |      | - final project - P   |      | - P, max. 10 pts.<br>40%                             |
| 10.4 Minimum standard of performance        |      |  |      |   |      |  |
| E1≥ 4.5 and E2≥ 4.5 and L ≥ 4.5 and P ≥ 4.5 |      |  |      |   |      |  |

Date of filling in Course responsible Teachers in charge of applications

1.10.2018 Associate Professor Assistant Professor
Bogdan ORZA, PhD Serban MEZA, PhD

Date of approval in the department 1.10.2018

**Head of Communications Department** 

Professor Virgil DOBROTA, PhD