

SYLLABUS / FIȘA DISCIPLINEI
1. Information on the study programme / Date despre programul de studii

1.1. Institution / Instituția de învățământ superior	Universitatea de Vest din Timișoara
1.2. Faculty / Facultatea	Matematică și Informatică
1.3. Department / Departamentul	Computer Science (Informatică)
1.4. Study program field	Computer Science (Informatică)
1.5. Study cycle/ Ciclul de studii	Bachelor / licență
1.6. Study programme / Programul de studii / calificarea*	Computer Science / Informatică în limba engleză / Database administration / <i>Administrator baze de date - 252101; Computer network administration / Administrator de rețea de calculatoare - 252301; Analyst / Analist - 251201; Research assistant in computer science / Asistent de cercetare în informatică - 214918; Teacher in secondary schools / Profesor în învățământul gimnazial - 233002; Programmer / Programator - 251202; Software systems designers / Proiectant sisteme informatice - 251101</i>

2. Information on the course / Date despre disciplină

2.1. Title of the course / Denumirea disciplinei	Databases I						
2.2. Lecture instructor / Titularul activităților de curs	Daniel Pop						
2.3. Seminar / laboratory instructor / Titularul activităților de seminar	Roxana Dogaru						
2.4. Study year / Anul de studii	2	2.5. Semester / Semestrul	1	2.6. Examination type / Tipul de evaluare: E(xam)/C(olloquim)	E	2.7. Course type / Regimul disciplinei: M(andatory)/ E(lective)/ F(acultative)	DI

3. Estimated study time (number of hours per semester) /Timpul total estimat (ore pe semestru al activităților didactice)

3.1. Attendance hours per week / Număr de ore pe săptămână	4	out of which din care: 3.2 lecture/ curs	2	3.3. seminar/laborator	2
3.4. Attendance hours per semester / Total ore din planul de învățământ	56	out of which: 3.5 lecture / curs	28	3.6. seminar/laborator	28
Distribution of the allocated amount of time / Distribuția fondului de timp*					hours/ ore
Individual study /Studiu după manual, suport de curs, bibliografie și notițe					20
Supplementary documentation at library or using electronic repositories / Documentare suplimentară în bibliotecă, pe platformele electronice de specialitate					15
Preparing for laboratories, homework, reports etc. /Pregătire seminarii/laboratoare, teme, referate, portofolii și eseuri					25
Exams / Examinări					6

Tutoring / Tutorat		8
3.7. Total number of hours of individual study / Total ore studiu individual	74	
3.8. Total number of hours per semester / Total ore pe semestru	130	
3.9. Number of credits (ECTS) / Număr de credite	5	

4. Prerequisites (if it is the case) / Precondiții (acolo unde e cazul)

4.1. curriculum / de curriculum	Algorithms and Data Structures I and II, Programming I, Algebra
4.2. competences / de competențe	Proficiency in English, Analytical mindset, Ability to decompose complex problems into sub-problems

5. Requirements (if it is the case) / Condiții (acolo unde e cazul)

5.1. for the lecture / de desfășurare a cursului	Room equipped with beamer and whiteboard
5.2. for the seminar, laboratory / de desfășurare a seminarului/laboratorului	Room equipped with computers running Oracle SQL Developer tool and available connectivity to an Oracle Database server (Academic licence provided)

6. Acquired skills / Competențe specifice acumulate

Professional skills / Competențe profesionale	<ul style="list-style-type: none"> • Ability to approach a problem using a relational database approach • Good knowledge of techniques and methodologies specific to relational database design • Basic understanding of NoSQL database systems • Ability to manage relational data (query, insert, update, delete) using SQL language • Ability to handle security issues for relational database management systems (users, roles, permissions)
Transversal skills / Competențe transversale	<ul style="list-style-type: none"> • Ability to analyse, design and implement simple and moderate complexity use cases using computer-based models (database approach) • Ability to express high-level, human specific questions into machine-specific languages

7. Objectives of the course / Obiectivele disciplinei (reieșind din grila competențelor specifice acumulate)

7.1. General objective / Obiectivul general al disciplinei	Understand and apply the relational database approach to model and implement systems and use cases from real-life
7.2. Specific objectives / Obiectivele specifice	<i>Knowledge wise objectives (KO):</i> (1) Good understanding of relational database approach; (2) Relational database design and efficient implementation (3) Basic understanding of NoSQL datastores.

	<p><i>Ability wise objectives (AO):</i> (1) Design of simple systems using relational database approach; (2) Use SQL language to represent end-users queries against relational databases.</p> <p><i>Skills wise objectives (SO):</i> (1) Argue about advantages and shortcomings of different model used in modern database management systems</p>
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8. Content / Conținuturi*

8.1. Lecture / Curs	Teaching strategies / Metode de predare	Remarks, details / Observații
C1. Basic concepts of database approach. Roles. Components of database system (2h)	Lecture, discussion, active student participation	Lecture notes http://web.info.uvt.ro/~danielpop Thomas Connolly and Carolyn Begg, Database Systems - A Practical Approach to Design, Implementation, and Management (4th edition) – Chapter 1
C2. The database environment (2h)	Idem	Lecture notes http://web.info.uvt.ro/~danielpop Thomas Connolly and Carolyn Begg, Database Systems - A Practical Approach to Design, Implementation, and Management (4th edition) – Chapter 2
C3. Conceptual, logical and physical design of databases (2h)	Idem	Lecture notes http://web.info.uvt.ro/~danielpop Thomas Connolly and Carolyn Begg, Database Systems - A Practical Approach to Design, Implementation, and Management (4th edition) – Chapter 11/12
C4. The relational model. Basic concepts. Relational integrity (2h)	Idem	Lecture notes http://web.info.uvt.ro/~danielpop Thomas Connolly and Carolyn Begg, Database Systems - A Practical Approach to Design, Implementation, and Management (4th edition) – Chapter 3
C5. The relational model. Relational algebra. Codd rules. SQL as an implementation of relational model (2h)	Idem	Lecture notes http://web.info.uvt.ro/~danielpop Thomas Connolly and Carolyn Begg, Database Systems - A Practical Approach to Design, Implementation, and Management (4th edition) – Chapter 4
C6. Normalization process.	Idem	Lecture notes

Functional dependencies. Normal forms 1NF, 2NF, 3NF (2h)		http://web.info.uvt.ro/~danielpop Thomas Connolly and Carolyn Begg, Database Systems - A Practical Approach to Design, Implementation, and Management (4th edition) – Chapter 13
C7. Normalization process. Normal forms BCNF, 4NF and 5NF. Multi-valued dependencies (2h)	Idem	Lecture notes http://web.info.uvt.ro/~danielpop Thomas Connolly and Carolyn Begg, Database Systems - A Practical Approach to Design, Implementation, and Management (4th edition) – Chapter 14
C8. Indexes. Role. Utilization. Implementation (2h)	Idem	Lecture notes http://web.info.uvt.ro/~danielpop Thomas Connolly and Carolyn Begg, Database Systems - A Practical Approach to Design, Implementation, and Management (4th edition) – Chapter 17, Annex C5
C9. Concurrency in relational database systems. Anomalies. Transactions. Isolation levels. (2h)	Idem	Lecture notes http://web.info.uvt.ro/~danielpop Thomas Connolly and Carolyn Begg, Database Systems - A Practical Approach to Design, Implementation, and Management (4th edition) – Chapter 6.5 and 20
C10. Triggers and views (2h)	Idem	Lecture notes http://web.info.uvt.ro/~danielpop Thomas Connolly and Carolyn Begg, Database Systems - A Practical Approach to Design, Implementation, and Management (4th edition) – Chapter 8.2.7, 6.4, 3.4
C11. A practical use-case to illustrate the database modelling process (2h)	Idem	Lecture notes http://web.info.uvt.ro/~danielpop Thomas Connolly and Carolyn Begg, Database Systems - A Practical Approach to Design, Implementation, and Management (4th edition) – Chapters 15, 16, 17
C12. Introduction to NoSQL databases. Data representation	Idem	Lecture notes http://web.info.uvt.ro/~danielpop

models: XML and JSON (2h)		Pramod J. Sadalage, Martin Fowler. NoSQL Distilled – Chapter 1
C13. Key-value datastores. Document oriented databases (2h)	Idem	Lecture notes http://web.info.uvt.ro/~danielpop Pramod J. Sadalage, Martin Fowler. NoSQL Distilled – Chapters 8, 9
C14. Columnar databases. Graph databases (2h)	Idem	Lecture notes http://web.info.uvt.ro/~danielpop Pramod J. Sadalage, Martin Fowler. NoSQL Distilled – Chapters 10, 11
Recommended bibliography / Bibliografie [1] Thomas Connolly and Carolyn Begg, Database Systems - A Practical Approach to Design, Implementation, and Management (4th edition), Addison-Wesley, 2004 [2] Jeffrey Ullman, Jennifer Widom, A First Course in Database Systems (3rd edition), Prentice Hall, 2007 [3] Pramod J. Sadalage, Martin Fowler. NoSQL Distilled, Addison Wesley, 2012		
8.2. Seminar, lab / Seminar, laborator	Teaching/learning strategies / Metode de predare/ învățare	Remarks, details / Observații
L1-L5 (10h) Query relational database using SQL SELECT	Active participation, Discussion, Self-conducted practical work	Running SQL queries using Oracle SQL Developer tool against a pre-built database
L6-L7. (4h) Data definition using SQL CREATE, DROP	Idem	Changes applied to an existing relational database
L8 (2h) Knowledge evaluation	Asses practical abilities in using SQL SELECT, CREATE and DROP commands	Practical / written test to asses the intermediary level
L9-L10 (4h) Update relational database records using SQL INSERT, UPDATE, DELETE	Idem	Running SQL commands using Oracle SQL Developer tool against a pre-built database
L11-L12 (4h) User administration and database security issues	Idem	Idem
L13-L14. (4h) Transactions control	Idem	Idem
Recommended bibliography / Bibliografie		

9. Correlations between the content of the course and the requirements of the IT field / Coroborarea conținuturilor disciplinei cu așteptările reprezentanților comunității epistemice, asociațiilor profesionale și angajatorilor reprezentativi din domeniul aferent programului

The relational database approach is the prevalent, de-facto approach used to implement complex systems across multiple businesses, such as financial, commercial, industrial or online commerce. The local, national and international workforce market is continuously looking for highly-skilled personnel to program, administer or configure relational, and more recently NoSQL, database management systems.

10. Evaluation / Evaluare*

Activity / Tip de activitate	10.1. Evaluation criteria / Criterii de evaluare**	10.2. Evaluation methods / Metode de evaluare***	10.3. Weight in the averaged mark / Pondere din nota finală
10.4. Lecture / Curs	<ul style="list-style-type: none"> • Good understanding of relational database approach; (KO1) • Relational database design and efficient implementation (KO2) • Basic understanding of NoSQL datastores • Design of simple systems using relational database approach; (AO1) • Argue about advantages and shortcomings of different model used in modern database management systems (SO1) 	Written test at examen	50%
10.5. Seminar/ lab	<ul style="list-style-type: none"> • Design of simple systems using relational database approach; (AO1) • Use SQL language to represent end-users queries against relational databases (AO2) 	Practical / written test during semester	25%
	<ul style="list-style-type: none"> • Design of simple systems using relational database approach; (AO1) • Use SQL language to represent end-users queries against relational databases (AO2) 	Practical / written test at the end / examen	25%
10.6. Minimal knowledge for passing / Standard minim de performanță			
<p>Minimal knowledge for passing this subject:</p> <ul style="list-style-type: none"> • Good knowledge of basic concepts of relational databases • Design a simple problem using a relational database • Identify functional dependencies and use them to normalize the database design to 3NF • Given a simple relational database design, implement it in a RDBMS using SQL commands • Ability to write simple SQL queries to retrieve data from 2 joined tables <p>The final grade is computed as a weighted average of grades obtained for components described in 10.4 and 10.5. The exam is passed if each individual grade obtained at components 10.4 and 10.5 (i.e. both lecture and lab evaluations) are greater or equal to 5. This rule is in force for all exam periods. The student need to re-take only the failed component (course or lab grade, respectively), unless the student wishes to re-take both evaluations.</p>			

Final remark: All students all welcome to tutoring meetings as scheduled by the department.

Date/ Data completării
1.10.2016

Signature (lecture) /
Semnătura titularului de curs

Signature (seminar)
Semnătura titularului de seminar

Signature (director of the department)
Semnătura directorului de departament
Conf.dr. Victoria Iordan