1. Index db sem3 - [index db](https://docs.google.com/document/d/1hiHn9TZzUUpUBxr1aSMPUkuFW2fLciLbI1XBr3aQjK4)
2. Encryption tool - <https://cryptii.com/pipes/vigenere-cipher>
3. Transactions - [L1, P11](https://moodle.cs.ubbcluj.ro/pluginfile.php/33682/mod_resource/content/1/DBMSs_lecture1.pdf#page=11)
4. ACID - [L1, P14](https://moodle.cs.ubbcluj.ro/pluginfile.php/33682/mod_resource/content/1/DBMSs_lecture1.pdf#page=14)
   1. Atomicity - [L1, P15](https://moodle.cs.ubbcluj.ro/pluginfile.php/33682/mod_resource/content/1/DBMSs_lecture1.pdf#page=15)
   2. Consistency - [L1, P17](https://moodle.cs.ubbcluj.ro/pluginfile.php/33682/mod_resource/content/1/DBMSs_lecture1.pdf#page=17)
   3. Isolation - [L1, P20](https://moodle.cs.ubbcluj.ro/pluginfile.php/33682/mod_resource/content/1/DBMSs_lecture1.pdf#page=20)
   4. Durability - [L1, P21](https://moodle.cs.ubbcluj.ro/pluginfile.php/33682/mod_resource/content/1/DBMSs_lecture1.pdf#page=21)
5. Write-Ahead log - [L1, P21](https://moodle.cs.ubbcluj.ro/pluginfile.php/33682/mod_resource/content/1/DBMSs_lecture1.pdf#page=21)
6. Anomalies examples (dirty read, nonrepeatable read etc) - [L1, P27](https://moodle.cs.ubbcluj.ro/pluginfile.php/33682/mod_resource/content/1/DBMSs_lecture1.pdf#page=27)
7. Serializability - [L1, P35](https://moodle.cs.ubbcluj.ro/pluginfile.php/33682/mod_resource/content/1/DBMSs_lecture1.pdf#page=35)
8. Conflict serializability, conflict relation - [L2, P2](https://moodle.cs.ubbcluj.ro/pluginfile.php/34009/mod_resource/content/1/DBMSs_lecture2.pdf#page=2)
   1. Precedence graph - [L2, P8](https://moodle.cs.ubbcluj.ro/pluginfile.php/34009/mod_resource/content/1/DBMSs_lecture2.pdf#page=8)
9. View serializability - [L2, P14](https://moodle.cs.ubbcluj.ro/pluginfile.php/34009/mod_resource/content/1/DBMSs_lecture2.pdf#page=14)
10. Recoverable schedules - [L2, P20](https://moodle.cs.ubbcluj.ro/pluginfile.php/34009/mod_resource/content/1/DBMSs_lecture2.pdf#page=20)
11. Lock based concurrency control - [L2, P24](https://moodle.cs.ubbcluj.ro/pluginfile.php/34009/mod_resource/content/1/DBMSs_lecture2.pdf#page=24)
    1. S lock, X lock - [L2, P25](https://moodle.cs.ubbcluj.ro/pluginfile.php/34009/mod_resource/content/1/DBMSs_lecture2.pdf#page=25)
12. ADO.NET - [S1, P6](https://moodle.cs.ubbcluj.ro/pluginfile.php/33921/mod_resource/content/1/DBMSs_Seminar1.pdf#page=6)
13. Strict 2-phase locking (2PL) - [L3, P3](https://moodle.cs.ubbcluj.ro/pluginfile.php/34037/mod_resource/content/1/DBMSs_lecture3.pdf#page=3)
14. (Normal) 2-phase locking - [L3, P8](https://moodle.cs.ubbcluj.ro/pluginfile.php/34037/mod_resource/content/1/DBMSs_lecture3.pdf#page=8)
15. Strict schedules - [L3, P12](https://moodle.cs.ubbcluj.ro/pluginfile.php/34037/mod_resource/content/1/DBMSs_lecture3.pdf#page=12)
16. Deadlocks - [L3, P13](https://moodle.cs.ubbcluj.ro/pluginfile.php/34037/mod_resource/content/1/DBMSs_lecture3.pdf#page=13); [S3, P20](https://moodle.cs.ubbcluj.ro/pluginfile.php/34376/mod_resource/content/1/DBMSs_Seminar3.pdf#page=20)
    1. Deadlock prevention (wait-die, wound-wait) - [L3, P15](https://moodle.cs.ubbcluj.ro/pluginfile.php/34037/mod_resource/content/1/DBMSs_lecture3.pdf#page=15)
    2. Waits-for graph - [L3, P20](https://moodle.cs.ubbcluj.ro/pluginfile.php/34037/mod_resource/content/1/DBMSs_lecture3.pdf#page=20)
    3. Timeout mechanism - [L3, P25](https://moodle.cs.ubbcluj.ro/pluginfile.php/34037/mod_resource/content/1/DBMSs_lecture3.pdf#page=25)
17. Phantom problem - [L3, P26](https://moodle.cs.ubbcluj.ro/pluginfile.php/34037/mod_resource/content/1/DBMSs_lecture3.pdf#page=26)
18. Isolation levels - [L3, P31](https://moodle.cs.ubbcluj.ro/pluginfile.php/34037/mod_resource/content/1/DBMSs_lecture3.pdf#page=31)
    1. Read uncommitted - [L3, P33](https://moodle.cs.ubbcluj.ro/pluginfile.php/34037/mod_resource/content/1/DBMSs_lecture3.pdf#page=33)
    2. Read committed - [L3, P34](https://moodle.cs.ubbcluj.ro/pluginfile.php/34037/mod_resource/content/1/DBMSs_lecture3.pdf#page=34)
    3. Repeatable read - [L3, P35](https://moodle.cs.ubbcluj.ro/pluginfile.php/34037/mod_resource/content/1/DBMSs_lecture3.pdf#page=35)
    4. Serializable - [L3, P36](https://moodle.cs.ubbcluj.ro/pluginfile.php/34037/mod_resource/content/1/DBMSs_lecture3.pdf#page=36)
19. Recovery manager - [L4, P2](https://moodle.cs.ubbcluj.ro/pluginfile.php/34137/mod_resource/content/1/DBMSs_lecture4.pdf#page=2)
20. Transaction failure causes - [L4, P4](https://moodle.cs.ubbcluj.ro/pluginfile.php/34137/mod_resource/content/1/DBMSs_lecture4.pdf#page=4)
21. Buffer manager - [L4, P9](https://moodle.cs.ubbcluj.ro/pluginfile.php/34137/mod_resource/content/1/DBMSs_lecture4.pdf#page=9)
    1. Steal / no steal, force / no force - [L4, P14](https://moodle.cs.ubbcluj.ro/pluginfile.php/34137/mod_resource/content/1/DBMSs_lecture4.pdf#page=14)
22. ARIES - [L4, P17](https://moodle.cs.ubbcluj.ro/pluginfile.php/34137/mod_resource/content/1/DBMSs_lecture4.pdf#page=17); [L5, P2](https://moodle.cs.ubbcluj.ro/pluginfile.php/34375/mod_resource/content/1/DBMSs_lecture5.pdf#page=2)
    1. Analysis phase (in more detail + example) - [L5, P5](https://moodle.cs.ubbcluj.ro/pluginfile.php/34375/mod_resource/content/1/DBMSs_lecture5.pdf#page=5)
    2. Redo... - [L5, P14](https://moodle.cs.ubbcluj.ro/pluginfile.php/34375/mod_resource/content/1/DBMSs_lecture5.pdf#page=14)
    3. Undo - [L5, P19](https://moodle.cs.ubbcluj.ro/pluginfile.php/34375/mod_resource/content/1/DBMSs_lecture5.pdf#page=19)
    4. Example system crash during undo - [L5, P22](https://moodle.cs.ubbcluj.ro/pluginfile.php/34375/mod_resource/content/1/DBMSs_lecture5.pdf#page=22)
23. Storage media - [L4, P20](https://moodle.cs.ubbcluj.ro/pluginfile.php/34137/mod_resource/content/1/DBMSs_lecture4.pdf#page=20)
24. Log - [L4, P21](https://moodle.cs.ubbcluj.ro/pluginfile.php/34137/mod_resource/content/1/DBMSs_lecture4.pdf#page=21)
    1. Update log record - [L4, P26](https://moodle.cs.ubbcluj.ro/pluginfile.php/34137/mod_resource/content/1/DBMSs_lecture4.pdf#page=26)
    2. Compensation log record - [L4, P27](https://moodle.cs.ubbcluj.ro/pluginfile.php/34137/mod_resource/content/1/DBMSs_lecture4.pdf#page=27)
25. Transaction table - [L4, P29](https://moodle.cs.ubbcluj.ro/pluginfile.php/34137/mod_resource/content/1/DBMSs_lecture4.pdf#page=29)
26. Dirty page table - [L4, P31](https://moodle.cs.ubbcluj.ro/pluginfile.php/34137/mod_resource/content/1/DBMSs_lecture4.pdf#page=31)
27. Checkpointing - [L4, P33](https://moodle.cs.ubbcluj.ro/pluginfile.php/34137/mod_resource/content/1/DBMSs_lecture4.pdf#page=33)
28. Currency manager - [S2, P5](https://moodle.cs.ubbcluj.ro/pluginfile.php/34138/mod_resource/content/1/DBMSs_Seminar2.pdf#page=5)
29. Creating an app in VS - [S2, P14](https://moodle.cs.ubbcluj.ro/pluginfile.php/34138/mod_resource/content/1/DBMSs_Seminar2.pdf#page=14)
30. Aspects related to security - [L6, P3](https://moodle.cs.ubbcluj.ro/pluginfile.php/34400/mod_resource/content/1/DBMSs_lecture6.pdf#page=3)
    1. Discretionary control - [L6, P6](https://moodle.cs.ubbcluj.ro/pluginfile.php/34400/mod_resource/content/1/DBMSs_lecture6.pdf#page=6) si de la [P8](https://moodle.cs.ubbcluj.ro/pluginfile.php/34400/mod_resource/content/1/DBMSs_lecture6.pdf#page=8) incolo
       1. GRANT statement - [L6, P11](https://moodle.cs.ubbcluj.ro/pluginfile.php/34400/mod_resource/content/1/DBMSs_lecture6.pdf#page=11)
       2. REVOKE statement - [L6, P12](https://moodle.cs.ubbcluj.ro/pluginfile.php/34400/mod_resource/content/1/DBMSs_lecture6.pdf#page=12)
    2. Mandatory control; Bell and La Padula rules - [L6, P7;](https://moodle.cs.ubbcluj.ro/pluginfile.php/34400/mod_resource/content/1/DBMSs_lecture6.pdf#page=7) [L6, P15](https://moodle.cs.ubbcluj.ro/pluginfile.php/34400/mod_resource/content/1/DBMSs_lecture6.pdf#page=15)
    3. Audit trail - [L6, P16](https://moodle.cs.ubbcluj.ro/pluginfile.php/34400/mod_resource/content/1/DBMSs_lecture6.pdf#page=16)
    4. SQL injection - [L6, P17](https://moodle.cs.ubbcluj.ro/pluginfile.php/34400/mod_resource/content/1/DBMSs_lecture6.pdf#page=17)
    5. Data encryption - [L6, P25](https://moodle.cs.ubbcluj.ro/pluginfile.php/34400/mod_resource/content/1/DBMSs_lecture6.pdf#page=25)
    6. Substitution (stenography, cryptography) - [L6, P27](https://moodle.cs.ubbcluj.ro/pluginfile.php/34400/mod_resource/content/1/DBMSs_lecture6.pdf#page=27)
    7. Encryption algorithm example - [L6, P33](https://moodle.cs.ubbcluj.ro/pluginfile.php/34400/mod_resource/content/1/DBMSs_lecture6.pdf#page=33)
31. Transactions in SQL server - [S3, P3](https://moodle.cs.ubbcluj.ro/pluginfile.php/34376/mod_resource/content/1/DBMSs_Seminar3.pdf#page=3)
    1. Concurrency problems - [S3, P5](https://moodle.cs.ubbcluj.ro/pluginfile.php/34376/mod_resource/content/1/DBMSs_Seminar3.pdf#page=5)
    2. Locking in SQL server - [S3, P9](https://moodle.cs.ubbcluj.ro/pluginfile.php/34376/mod_resource/content/1/DBMSs_Seminar3.pdf#page=9)
    3. Isolation levels in SQL server - [S3, P16](https://moodle.cs.ubbcluj.ro/pluginfile.php/34376/mod_resource/content/1/DBMSs_Seminar3.pdf#page=16)
32. Relational algebra - [L7, P2](https://moodle.cs.ubbcluj.ro/pluginfile.php/34424/mod_resource/content/1/DBMSs_lecture7.pdf#page=2)
33. Access paths - [L7, P7](https://moodle.cs.ubbcluj.ro/pluginfile.php/34424/mod_resource/content/1/DBMSs_lecture7.pdf#page=7)
    1. Hash index - [L7, P11](https://moodle.cs.ubbcluj.ro/pluginfile.php/34424/mod_resource/content/1/DBMSs_lecture7.pdf#page=11)
    2. Tree index - [L7, P12](https://moodle.cs.ubbcluj.ro/pluginfile.php/34424/mod_resource/content/1/DBMSs_lecture7.pdf#page=12)
    3. General selection - [L7, P16](https://moodle.cs.ubbcluj.ro/pluginfile.php/34424/mod_resource/content/1/DBMSs_lecture7.pdf#page=16)
34. Joins - [L7, P20](https://moodle.cs.ubbcluj.ro/pluginfile.php/34424/mod_resource/content/1/DBMSs_lecture7.pdf#page=20)
    1. Simple nested loops join - [L7, P22](https://moodle.cs.ubbcluj.ro/pluginfile.php/34424/mod_resource/content/1/DBMSs_lecture7.pdf#page=22)
    2. Page-oriented nested loops join - [L7, P23](https://moodle.cs.ubbcluj.ro/pluginfile.php/34424/mod_resource/content/1/DBMSs_lecture7.pdf#page=23)
    3. Block nested loops join - [L7, P25](https://moodle.cs.ubbcluj.ro/pluginfile.php/34424/mod_resource/content/1/DBMSs_lecture7.pdf#page=25)
    4. Index nested loops join - [L7, P33](https://moodle.cs.ubbcluj.ro/pluginfile.php/34424/mod_resource/content/1/DBMSs_lecture7.pdf#page=33)
    5. Sort merge join - [L8, P33](https://moodle.cs.ubbcluj.ro/pluginfile.php/34518/mod_resource/content/1/DBMSs_lecture8.pdf#page=33)
    6. Hash join - [L9, P3](https://moodle.cs.ubbcluj.ro/pluginfile.php/34595/mod_resource/content/1/DBMSs_lecture9.pdf#page=3); [L9, P9](https://moodle.cs.ubbcluj.ro/pluginfile.php/34595/mod_resource/content/1/DBMSs_lecture9.pdf#page=9)
    7. General join conditions - [L9, P12](https://moodle.cs.ubbcluj.ro/pluginfile.php/34595/mod_resource/content/1/DBMSs_lecture9.pdf#page=12)
35. Sorting - [L8, P5](https://moodle.cs.ubbcluj.ro/pluginfile.php/34518/mod_resource/content/1/DBMSs_lecture8.pdf#page=5)
    1. Simple 2-way merge sort - [L8, P6](https://moodle.cs.ubbcluj.ro/pluginfile.php/34518/mod_resource/content/1/DBMSs_lecture8.pdf#page=6); [L8, P16](https://moodle.cs.ubbcluj.ro/pluginfile.php/34518/mod_resource/content/1/DBMSs_lecture8.pdf#page=16)
    2. External merge sort - [L8, P18](https://moodle.cs.ubbcluj.ro/pluginfile.php/34518/mod_resource/content/1/DBMSs_lecture8.pdf#page=18); [L8, P28](https://moodle.cs.ubbcluj.ro/pluginfile.php/34518/mod_resource/content/1/DBMSs_lecture8.pdf#page=28)
36. RLV (row level versioning) - [S4, P8](https://moodle.cs.ubbcluj.ro/pluginfile.php/34519/mod_resource/content/1/DBMSs_Seminar4.pdf#page=8)
    1. Read committed snapshot isolation - [S4, P9](https://moodle.cs.ubbcluj.ro/pluginfile.php/34519/mod_resource/content/1/DBMSs_Seminar4.pdf#page=9)
37. Query governor, DBCC log, PIVOT/ UNPIVOT, OUTPUT - incep la [S4, P17](https://moodle.cs.ubbcluj.ro/pluginfile.php/34519/mod_resource/content/1/DBMSs_Seminar4.pdf#page=17)
38. Merge statement - [S4, P21](https://moodle.cs.ubbcluj.ro/pluginfile.php/34519/mod_resource/content/1/DBMSs_Seminar4.pdf#page=21)
39. Selection - [L9, P15](https://moodle.cs.ubbcluj.ro/pluginfile.php/34595/mod_resource/content/1/DBMSs_lecture9.pdf#page=15)
    1. With b+ tree index on an attr - [L9, P18](https://moodle.cs.ubbcluj.ro/pluginfile.php/34595/mod_resource/content/1/DBMSs_lecture9.pdf#page=18)
    2. General selection without disjunctions - [L9, P22](https://moodle.cs.ubbcluj.ro/pluginfile.php/34595/mod_resource/content/1/DBMSs_lecture9.pdf#page=22)
    3. … with disjunctions - [L9, P24](https://moodle.cs.ubbcluj.ro/pluginfile.php/34595/mod_resource/content/1/DBMSs_lecture9.pdf#page=24)
40. Projection - [L9, P26](https://moodle.cs.ubbcluj.ro/pluginfile.php/34595/mod_resource/content/1/DBMSs_lecture9.pdf#page=26)
    1. Based on sorting - [L9, P27](https://moodle.cs.ubbcluj.ro/pluginfile.php/34595/mod_resource/content/1/DBMSs_lecture9.pdf#page=27)
    2. Based on hashing - [L9, P32](https://moodle.cs.ubbcluj.ro/pluginfile.php/34595/mod_resource/content/1/DBMSs_lecture9.pdf#page=32)
41. Set operations (intersection, cross product, union) - [L9, P36](https://moodle.cs.ubbcluj.ro/pluginfile.php/34595/mod_resource/content/1/DBMSs_lecture9.pdf#page=36)
42. Aggregate operations - [L9, P38](https://moodle.cs.ubbcluj.ro/pluginfile.php/34595/mod_resource/content/1/DBMSs_lecture9.pdf#page=38)
43. Query optimization - [L9, P40](https://moodle.cs.ubbcluj.ro/pluginfile.php/34595/mod_resource/content/1/DBMSs_lecture9.pdf#page=40)
44. Pipelined evaluation - [L9, P45](https://moodle.cs.ubbcluj.ro/pluginfile.php/34595/mod_resource/content/1/DBMSs_lecture9.pdf#page=45)
45. Query blocks - [L9, P47](https://moodle.cs.ubbcluj.ro/pluginfile.php/34595/mod_resource/content/1/DBMSs_lecture9.pdf#page=47)
46. Estimating the cost of a plan - [L10, P6](https://moodle.cs.ubbcluj.ro/pluginfile.php/34837/mod_resource/content/1/DBMSs_lecture10.pdf#page=6)
47. Statistics maintained by the DBMS - [L10, P8](https://moodle.cs.ubbcluj.ro/pluginfile.php/34837/mod_resource/content/1/DBMSs_lecture10.pdf#page=8)
48. Estimating result sizes, reduction factor - [L10, P10](https://moodle.cs.ubbcluj.ro/pluginfile.php/34837/mod_resource/content/1/DBMSs_lecture10.pdf#page=10)
49. Relational algebra equivalences - [L10, P15](https://moodle.cs.ubbcluj.ro/pluginfile.php/34837/mod_resource/content/1/DBMSs_lecture10.pdf#page=15)
50. Enumeration of alternative plans - [L10, P20](https://moodle.cs.ubbcluj.ro/pluginfile.php/34837/mod_resource/content/1/DBMSs_lecture10.pdf#page=20)
    1. Query with 1 relation in FROM; example from query to algebra - [L10, P21](https://moodle.cs.ubbcluj.ro/pluginfile.php/34837/mod_resource/content/1/DBMSs_lecture10.pdf#page=21)
    2. Query with +2 relations in FROM - [L10, P29](https://moodle.cs.ubbcluj.ro/pluginfile.php/34837/mod_resource/content/1/DBMSs_lecture10.pdf#page=29)
       1. Left-deep trees - [L10, P30](https://moodle.cs.ubbcluj.ro/pluginfile.php/34837/mod_resource/content/1/DBMSs_lecture10.pdf#page=30)
51. Nested queries - [L10, P37](https://moodle.cs.ubbcluj.ro/pluginfile.php/34837/mod_resource/content/1/DBMSs_lecture10.pdf#page=37)
52. Query fine-tuning
    1. Identify waits - [S5, P3](https://moodle.cs.ubbcluj.ro/pluginfile.php/34838/mod_resource/content/1/DBMSs_Seminar5.pdf#page=3)
    2. Correlate waits with queues - [S5, P4](https://moodle.cs.ubbcluj.ro/pluginfile.php/34838/mod_resource/content/1/DBMSs_Seminar5.pdf#page=4)
    3. Drill down to DB / file level - [S5, P9](https://moodle.cs.ubbcluj.ro/pluginfile.php/34838/mod_resource/content/1/DBMSs_Seminar5.pdf#page=9)
    4. Drill down to process level - [S5, P12](https://moodle.cs.ubbcluj.ro/pluginfile.php/34838/mod_resource/content/1/DBMSs_Seminar5.pdf#page=12)
    5. Indexes - [S5, P13](https://moodle.cs.ubbcluj.ro/pluginfile.php/34838/mod_resource/content/1/DBMSs_Seminar5.pdf#page=13)
    6. Tools to analyze query performance - [S5, P16](https://moodle.cs.ubbcluj.ro/pluginfile.php/34838/mod_resource/content/1/DBMSs_Seminar5.pdf#page=16)
    7. STATISTICS IO, STATISTICS TIME - [S5, P19](https://moodle.cs.ubbcluj.ro/pluginfile.php/34838/mod_resource/content/1/DBMSs_Seminar5.pdf#page=19)
    8. Graphical execution plan - [S5, P26](https://moodle.cs.ubbcluj.ro/pluginfile.php/34838/mod_resource/content/1/DBMSs_Seminar5.pdf#page=26)
53. Distributed DB - [L11, P3](https://moodle.cs.ubbcluj.ro/pluginfile.php/35010/mod_resource/content/1/DBMSs_lecture11.pdf#page=3)
54. Storing data in a distributed DBMS - [L11, P12](https://moodle.cs.ubbcluj.ro/pluginfile.php/35010/mod_resource/content/1/DBMSs_lecture11.pdf#page=12)
    1. Fragmentation - [L11, P14](https://moodle.cs.ubbcluj.ro/pluginfile.php/35010/mod_resource/content/1/DBMSs_lecture11.pdf#page=14)
    2. Replication - [L11, P16](https://moodle.cs.ubbcluj.ro/pluginfile.php/35010/mod_resource/content/1/DBMSs_lecture11.pdf#page=16)
       1. Synchronous - [L11, P19](https://moodle.cs.ubbcluj.ro/pluginfile.php/35010/mod_resource/content/1/DBMSs_lecture11.pdf#page=19)
       2. Asynchronous (peer to peer, primary site, apply, capture, log based, procedural) - [L11, P22](https://moodle.cs.ubbcluj.ro/pluginfile.php/35010/mod_resource/content/1/DBMSs_lecture11.pdf#page=22)…
    3. Distributed query processing - [L11, P30](https://moodle.cs.ubbcluj.ro/pluginfile.php/35010/mod_resource/content/1/DBMSs_lecture11.pdf#page=30)
       1. Non-join queries - [L11, P31](https://moodle.cs.ubbcluj.ro/pluginfile.php/35010/mod_resource/content/1/DBMSs_lecture11.pdf#page=31)
       2. Join queries
          1. Fetch as needed - [L11, P36](https://moodle.cs.ubbcluj.ro/pluginfile.php/35010/mod_resource/content/1/DBMSs_lecture11.pdf#page=36), [L12, P3](https://moodle.cs.ubbcluj.ro/pluginfile.php/35014/mod_resource/content/1/DBMSs_lecture12.pdf#page=3)
          2. Ship to one site - [L12, P5](https://moodle.cs.ubbcluj.ro/pluginfile.php/35014/mod_resource/content/1/DBMSs_lecture12.pdf#page=5)
          3. Semijoin - [L12, P7](https://moodle.cs.ubbcluj.ro/pluginfile.php/35014/mod_resource/content/1/DBMSs_lecture12.pdf#page=7)
          4. Bloomjoin - [L12, P9](https://moodle.cs.ubbcluj.ro/pluginfile.php/35014/mod_resource/content/1/DBMSs_lecture12.pdf#page=9)
    4. Distributed catalog management (centralized system catalog, local / global catalog maintained at each site) - [L12, P11](https://moodle.cs.ubbcluj.ro/pluginfile.php/35014/mod_resource/content/1/DBMSs_lecture12.pdf#page=11)…
    5. Distributed transaction management
       1. Distributed concurrency control - [L12, P15](https://moodle.cs.ubbcluj.ro/pluginfile.php/35014/mod_resource/content/1/DBMSs_lecture12.pdf#page=15)
          1. Lock management - [L12, P16](https://moodle.cs.ubbcluj.ro/pluginfile.php/35014/mod_resource/content/1/DBMSs_lecture12.pdf#page=16)
          2. Distributed deadlock - [L12, P20](https://moodle.cs.ubbcluj.ro/pluginfile.php/35014/mod_resource/content/1/DBMSs_lecture12.pdf#page=20)
             1. Centralized detection algorithm - [L12, P23](https://moodle.cs.ubbcluj.ro/pluginfile.php/35014/mod_resource/content/1/DBMSs_lecture12.pdf#page=23)
             2. Hierarchical .. - [L12, P24](https://moodle.cs.ubbcluj.ro/pluginfile.php/35014/mod_resource/content/1/DBMSs_lecture12.pdf#page=24)
             3. Based on timeout - [L12, P26](https://moodle.cs.ubbcluj.ro/pluginfile.php/35014/mod_resource/content/1/DBMSs_lecture12.pdf#page=26)
             4. Phantom deadlocks - [L12, P27](https://moodle.cs.ubbcluj.ro/pluginfile.php/35014/mod_resource/content/1/DBMSs_lecture12.pdf#page=27)
       2. Distributed recovery - [L12, P28](https://moodle.cs.ubbcluj.ro/pluginfile.php/35014/mod_resource/content/1/DBMSs_lecture12.pdf#page=28)
          1. Two-phase commit protocol (2PC) - [L12, P30](https://moodle.cs.ubbcluj.ro/pluginfile.php/35014/mod_resource/content/1/DBMSs_lecture12.pdf#page=30); [L12, P40](https://moodle.cs.ubbcluj.ro/pluginfile.php/35014/mod_resource/content/1/DBMSs_lecture12.pdf#page=40)
          2. Restart after failure - [L12, P36](https://moodle.cs.ubbcluj.ro/pluginfile.php/35014/mod_resource/content/1/DBMSs_lecture12.pdf#page=36)