Decision Support Systems

Cod	Denumire	Ore: C+S+L+P	Finalizare	Credite
MID1009	Sisteme pentru fundamentarea deciziilor	2+1+0+1	E	8 cr.

Zi	*Ora*	*Sala*	*Fr.*	*Gr.*	*Tip*
Marti	16~18	L534	-_-	Ica, Is	*Curs*
	18~20	L308	S2		*Sem.*

- Mail: per@cs.ubbcluj.ro,
- Web: www.cs.ubbcluj.ro/~per
- Dss: http://www.cs.ubbcluj.ro/~per/Dss.html

Course objectives

7.1 General objective of the discipline	• Good understanding of hands-on applications; • Be able to identify meaningful applied computing problems ; • Be able to apply theories, principles and concepts with technologies to design, develop, and verify computational solutions;
7.2 Specific objective of the discipline	• Knowledge about general theory and specific DSS theory; • Systematic knowledge about what the designer of a DSS needs to know;

Course contents:

1. The concept of *Decision Support Systems* (DSS)
   - The Steps of Decision Support, Classification of Problems
   - The Components of a DSS.
   - Some Computerized Tools for Decision Support

2. Computerized Decision Support
   - Decision Making - Rational Decisions, Definitions of Rationality, Bounded Rationality and Muddling Through
   - Models, The Facilities of Models , Phases of the Decision-Making Process

3. The Nature of Managers, Appropriate Data Support, Information Processing Models.
   Group Decision Making

4. Decisions and Decision Modeling - Types of Decisions.
   - Human Judgment and Decision Making.
   - Modeling Decisions. Components of Decision Models

… Course contents:

5. Normative Systems - Normative and Descriptive Approaches. - Decision-Analytic Decision Support Systems. - Equation-Based and Mixed Systems
6. Data Component - Characteristics of Information. - Databases to Support Decision Making. - Database Management Systems
7. Data Warehouses. - Data Mining and Intelligent Agents
8. Model Component - Models, Representation, Methodology
9. Model Based Management Systems, Access to Models, and Understandability of Results. - Integrating Models, Sensitivity of a Decision

… Course contents:

10. Intelligence and Decision Support Systems
- Programming Reasoning
- Backward Chaining Reasoning and Forward Chaining Reasoning.

11. Knowledge Representation for Decision Support Systems
- Computational Intelligence for Decision Support,
- Expert Systems and Artificial Intelligence in Decision Support Systems

12. User Interfaces to Decision Support Systems.
- Support for Model Construction and Model Analysis.
- Support for Reasoning about the Problem Structure in Addition to Numerical Calculations.
- Support for Both Choice and Optimization of Decision Variables

13. Graphical Interface
- The Action Language, Menus.
  Mail Component
- Integration of Mail Management.
- Implications for DSS Design

14. Visualization in Decision Support Systems
- Visualization User Interface for Decision Support Systems

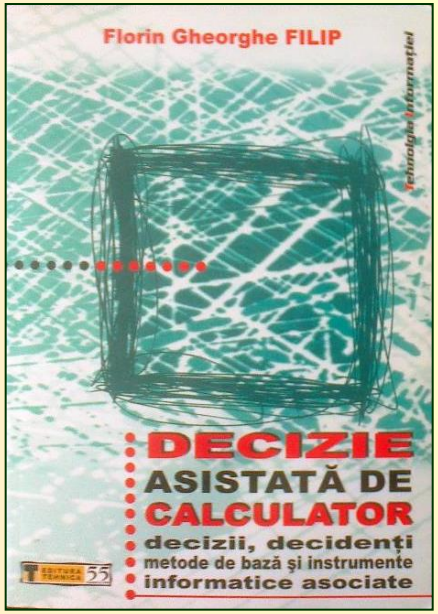
Total estimated time (hours/semester of didactic activities)

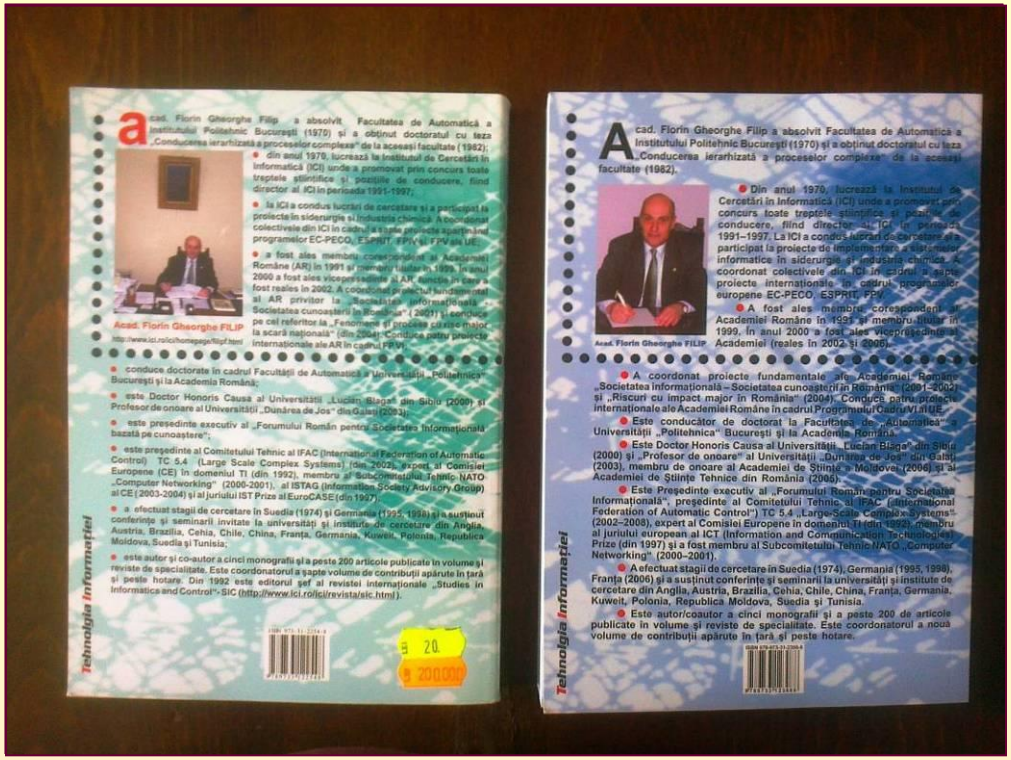
Hours per week	**3**	Of which: 2 course	**2**	seminar/laboratory	**1 / -**
Total hours in the curriculum	**42**	Of which: 5 course	**28**	seminar/laboratory	**14 / -**
Time allotment:					hours
Learning using manual, course support, bibliography, course notes					**36**
Additional documentation (on electronic platforms, field documentation, …)					**36**
Preparation for seminars/labs, homework, papers, portfolios and essays					**36**
Tutorship					**18**
Evaluations					**18**
Other activities: **Project**					**14**

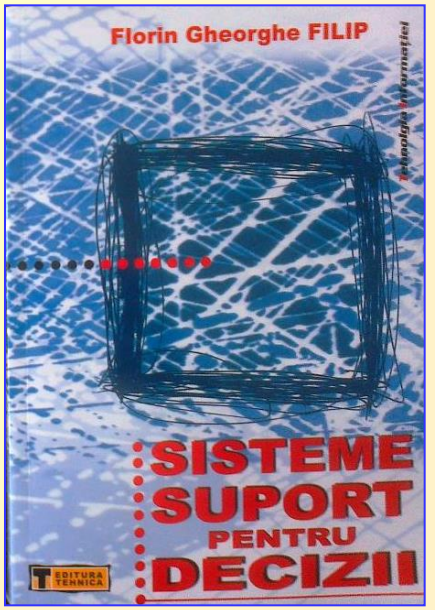
Total individual study hours	**158**
Total hours per semester	**200**
Number of ECTS credits	**8**

R_Bibliography:

1. Filip F.G. (2005), *Decizie asistata de calculator: decizii , decidenti, metode de baza si instrumente informatice asociate*, (Editia doua completata si revizuita a lucrarii din 2002), Ed. TEHNICA, Bucuresti, ISBN 973-31-2254-8, XXVIII + 376 pag. (http://www.academiaromana.ro/carti2005/c0414_ffilip.htm)
2. Filip, F.G. (2007). *Sisteme suport pentru decizii*. (Editia II revazuta si adaugita a lucrarii din 2004), Ed. TEHNICA, Bucuresti (ISBN978-973-31-2308-8), XI + XIX + 372 pag. (http://www.acad.ro/carti2007/carte07_02FF.htm).







E_Bibliography:

1. Alter, S. L. *Decision support systems: current practice and continuing challenges*. Reading, Mass., Addison-Wesley Pub., 1980.
2. Finlay, P. N., *Introducing decision support systems*. Oxford, UK Cambridge, Mass., NCC Blackwell; Blackwell Publishers, 1994.
3. Marakas, G.M. *Decision Support Systems in the 21st Century*. Prentice Hall, Upper Saddle River, NJ, 2003.
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5. Power, D. J. *Decision support systems: concepts and resources for managers*. Westport, Conn., Quorum Books, 2002.
6. Power, D. J. *Web-based and model-driven decision support systems: concepts and issues*. Proceedings of the Americas Conference on Information Systems, Long Beach, California, 2000.
7. Sauter, V. L. *Decision support systems: an applied managerial approach*. New York, John Wiley, 1997.
8. Silver, M. *Systems that support decision makers: description and analysis*. Chichester ; New York, Wiley, 1991.
9. Sprague, R. H. and E. D. Carlson. *Building effective decision support systems*. Englewood Cliffs, N.J., Prentice-Hall, 1982, ISBN 0-130-86215-
10. **Turban**, E.,Aronson, J.E., and Liang, T.P. *Decision Support Systems and Intelligent Systems*. New Jersey, Pearson Education, Inc, 2005.

See: http://www.cs.ubbcluj.ro/~per/Dss.html

Assessment

Evaluation:

Type of activity	Evaluation criteria	Evaluation methods	Share in the grade
Course	- know the basic elements and concepts of an Dss;	Written exam	50%
Seminar / Project	- complexity, importance and degree of timeliness of the synthesis made	Paper presentation	15%
	- apply the course concepts - problem solving	Project presentation	35%
Minimum performance standards			
➢At least grade 5 at written exam, paper presentations and project realised.			

Additional references:

1. French, S. and Geldermann, J. The varied contexts of environmental decision problems and their implications for decision support. *Environmental Science and Policy 8* (2005), 378–391.
2. Gadomski, A.M. at al.*An Approach to the Intelligent Decision Advisor (IDA) for Emergency Managers*.Int. J. Risk Assessment and Management, Vol. 2, Nos. 3/4., 2001.
3. Hackathorn, R. D., and P. G. W. Keen. (1981, September). "Organizational Strategies for Personal Computing in Decision Support Systems." MIS Quarterly, Vol. 5, No. 3.
4. Holsapple, C.W., and A. B. Whinston. (1996). Decision Support Systems: A Knowledge-Based Approach. St. Paul: West Publishing. ISBN 0-324-03578-0
5. Jiménez, Antonio; Ríos-Insua, Sixto; Mateos, Alfonso. Computers & Operations Research.
6. Joyce E. Berg, Thomas A. Rietz, *Prediction Markets as Decision Support Systems*, Kluwer Academic Publishers. Manufactured in The Netherlands, 2003.
7. Keen, P. G. W. (1978). Decision support systems: an organizational perspective. Reading, Mass.

8. Keen, P. G. W. (1980). Decision support systems: a research perspective. Decision support systems : issues and challenges. G. Fick and R. H. Sprague. Oxford ; New York, Pergamon Press.
9. Larissa T. Moss, Shaku Atre, *Business Intelligence Roadmap: The Complete Project Lifecycle for Decision-Support Applications* By Publisher: Addison Wesley Professional Pub Date: February 25, 2003 Print ISBN-10: 0-201-78420-3 Print ISBN-13: 978-0-201-78420-6 Pages: 576 Slots: 2.0
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17. Gachet, A. *Building Model-Driven Decision Support Systems with Dicodess*. Zurich, VDF, 2004.
18. Marakas, G. M. *Decision support systems in the twenty-first century*. Upper Saddle River, N.J., Prentice Hall, 1999.
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20. Reich, Yoram; Kapeliuk, Adi. Decision Support Systems., Nov2005, Vol. 41 Issue 1, p1-19, 19p.
21. Decision Support Systems. Elsevier B.V., 2007. [http://www.sciencedirect.com/science/journal/01679236]
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1. Introduction

The ***Decision Support Systems*** are used because they have the following **properties**:

- **Speedy computation**: enables many computations quickly at a low cost; the speed of executions increasing every day ;
- **Improved communication and collaboration**: decisions are made by groups from different locations (travel costs);
- **Increased productivity of group members**: using software optimization tools to find the best solution;
- **Improved data management**: store, search, transmit data (text, sound, graphics, video even in foreign languages) quickly, securely, and so on;
- **Managing giant data warehouse** – great storage capability of any type of information that can be accessed and searched very rapidly (parallel computing);

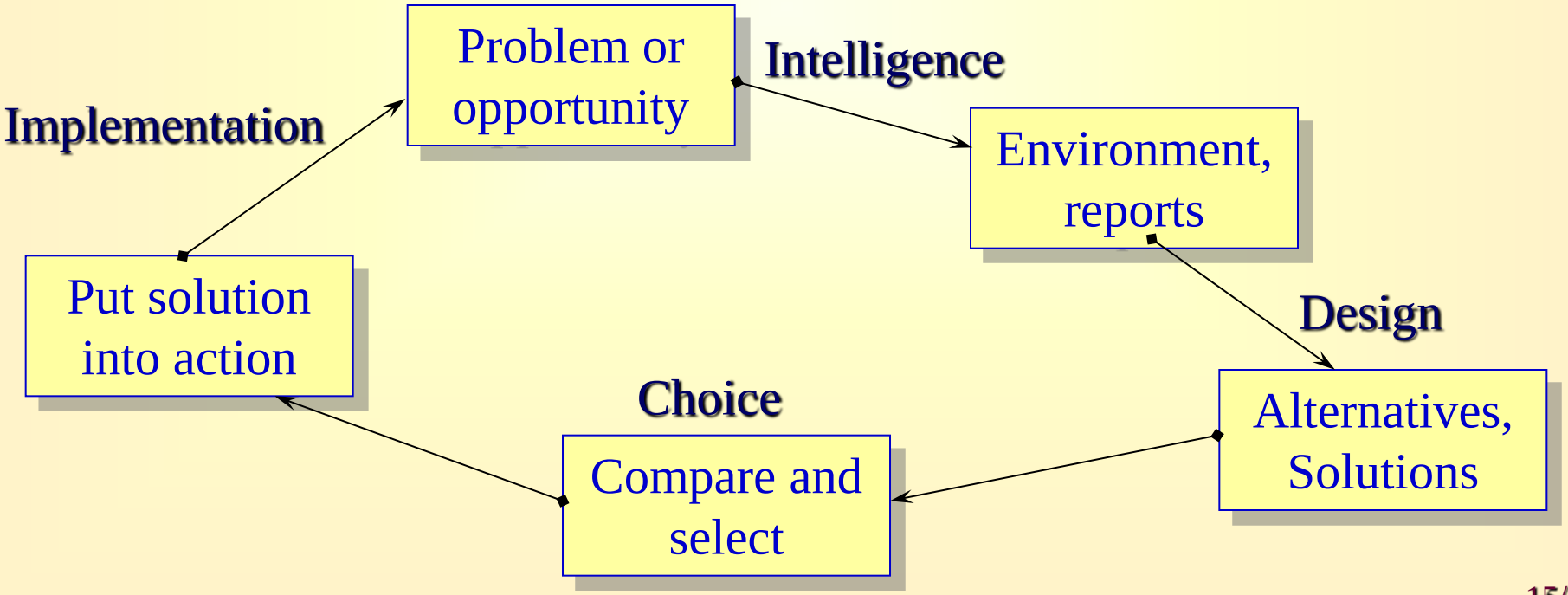
[22] -*Decision Support System and Business Intelligence* **Turban**, E., …

- **Quality support** : improve the quality of decisions made – more alternatives can be evaluated, (can be performed) quick(ly) risk analysis using simulations, artificial intelligence methods, …;
- **Agility support** : intelligent systems allow to make good and quick decisions;
- **Overcoming cognitive limits in processing and storing information** : computerized systems enable to overcome the cognitive limits by quickly accessing and processing stored information;
- **Using the Web** :
  - access to a vast body of data, information, knowledge,
  - user-friendly graphical user interface – GUI,
  - collaboration with remote partners,
  - intelligent search tools to find quickly any information;
- **Anywhere, anytime support** : using wireless technology, we can access information anytime and from anyplace and communicate the result of the analysis and interpretation.

1.1. The Steps of Decision Support

Simon (1977): the decision-making process is a 4-phase process:

- **Intelligence**: searching for conditions that call for decisions;
- **Design**: inventing, developing, analyzing solutions;
- **Choice**: selecting a course of action;
- **Implementation**: adapting the selected course of action;



1.2. Classification of Problems

The decision-making process may be range from highly structured (***programmed*** - with standard solution methods, because is possible to abstract, analyze, and classify into specific categories for which we have a model and a solution – *management science (MS) / operation research (OR)*) to highly unstructured (***non-programmed***- fuzzy, complex problems there are no cut and dried solution methods).

Definitions:

- An ***unstructured*** problem: all phases are unstructured,
- A ***structured*** problem: all phases are structured, the procedures for obtaining the best solution are known,
- ***Semi structured*** problem: has structured and also unstructured phases.

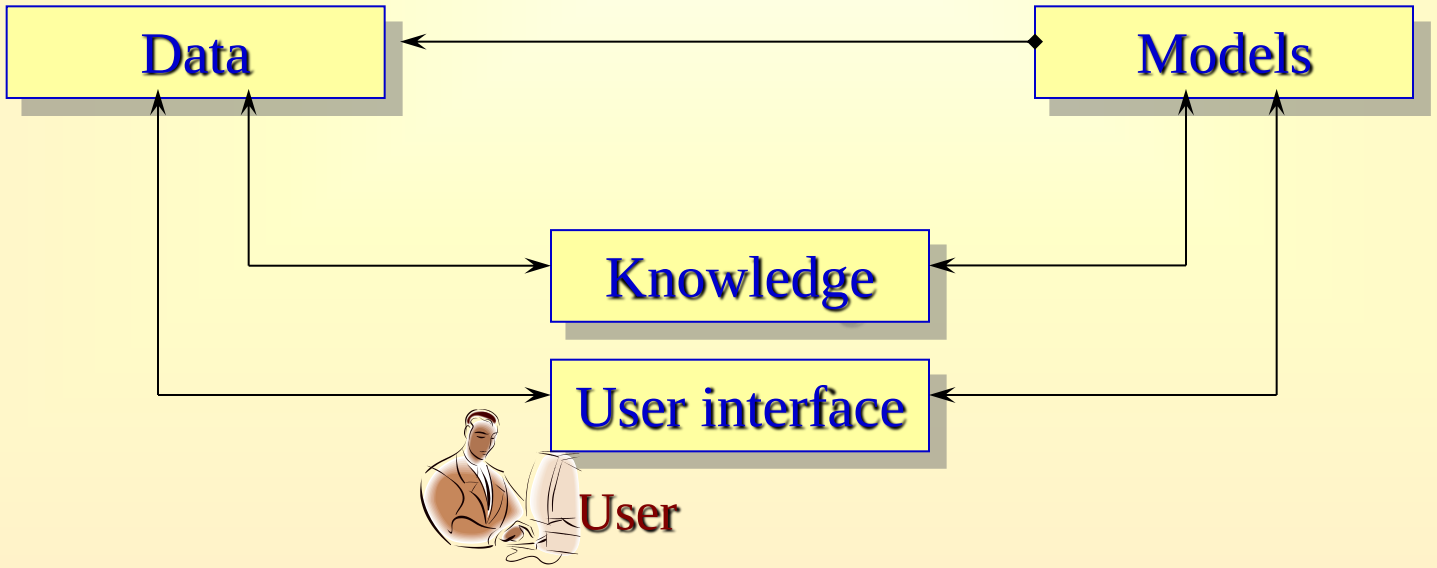
1.3. What is a DSS? - The concept of *Decision Support Systems* (DSS)

- Scott Morton (~1970) defined the major concepts of ***Decision Support Systems***.
- Gorry and Scott-Morton (1971) : "Interactive computer-based systems, which help decision maker utilize *data* and *model* to solve unstructured problems".
- Keen and Scott-Morton (1978) : "Decision support system couple the intellectual resources of individuals with the capabilities of the computer to improve the quality of decisions. It is a computer-based support system for management decision makers who deal with semi-structured problems".
- DSS can be used to describe any computerizing system that supports decision making in an organization.
- Observation: *Decision Support System* ≠ *Management Information System* (MIS).

1.4. The Components of a DSS - The *Architecture* of DSS

The term DSS can be use to refer to the DSS application.

1. Every problem requires **Data** from many sources;
2. Data are manipulated by using **Models** (standard or customized);
3. Systems sometimes have a **Knowledge** or **intelligence** component;
4. **Users** are another important component;
5. The **User interface** is the last component of the DSS architecture.



1.5. Some Computerized Tools for Decision Support

- **Data management**
  - DBMS - *Databases and database management system*;
  - ETL - *Extraction, transformation and load system*;
  - DW - *Data warehouses, real-time DW and data marts*;
- **Reporting status tracking**
  - OLAP - *Online analytical processing*;
  - EIS - *Executive information system*;
- **Visualization**
  - GIS - *Geographical information system*;
  - - *Dashboards*; *Information portals; Multidimensional presentation*;
- **Business analytics**
  - - *Optimization*; *Web analytics*;
  - - *Data mining, Web mining and text mining*;
- **Strategy and performance management**
  - B(C)PM- *Business (Corporate) performance management*;
  - BAM - *Business activity management*;
  - - *Dashboards and scorecards*;

… Some Computerized Tools for Decision Support

- **Communication and collaboration**
  - GDSS - *Group decision support system*;
  - GSS - *Group support system*;
  - - *Collaborative information portals and system*;
- **Knowledge management**
  - KMS - *Knowledge management systems*;
  - - *Expert locating system*;
- **Intelligent systems**
  - ES - *Expert systems*;
  - ANN - *Artificial neural networks*;
  - - *Fuzzy logic, Genetic algorithm, Intelligent agents;*
  - ADS - *Automated decision systems;*
- **Enterprise systems**
  - ERP - *Enterprise resource planning;*
  - CRM - *Customer relationship management;*
  - SCM - *Supply-chain management*;

1.6. Why companies (want to) use Computerized Decision Support ?

- Changing economy;
- Many business operations;
- Global competition;
- E-commerce;
- For decisions making;
- Solve directly the management's inquiries – without *Inf. Sys. Depart.*;
- Need a special analysis of profitability and efficiency;
- Need an accurate information;
- Computerizing support is viewed as an organizational winner;
- Need new information;
- Need higher decision quality;
- Desire improved communication;
- Want improve customer and employee satisfaction;
- Need timely information;
- Want to reduce costs;
- Want to see improved productivity.

Seminar *(Laboratory)*: the planning of the papers and projects.

- How many students? n
- How many papers/lab (2 weeks)? n/5
- When? For each student! (~What?) Paper ↔Project
- To do a Calendar 1-2; **3-11**, 13-14 (2,**9**,2) = **9 hours**
- Alphabetical ?
- Individually or in groups of 2,3, … students ??

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