(	Course Name	Semester	Theory	Practice	Lab	Credit	ECTS
D375 Applied Mathematical Modeling		6	3	0	0	3	4
IN	ND371						
Prerequisites IND371 Admission Requirements IND371							
Language of Instruction French							
	Elective						
	Bachelor Degree						
	This course introduces several different types of mathematical models, which can be used to formulate real-life problems, and the softwares GAMS and MATLAB, which can be used to solve different types of problems including linear, non-linear, integer, etc. The aim is to introduce the logic of modeling, which can further be useful for academic studies and in industry. Hence, the objectives of the course are determined as follows:  • Introduce how to build mathematical models of the real-life problems.  • Enable students to use the softwares GAMS and MATLAB for programming and optimization.						
	Introduction to GAMS and solution of a simple transportation problem through GAMS Modeling of linear programming problems (Bazaraa, Jarvis & Sherali, Chapter 1, Bertsimas & Tsitsiklis, Chapter 1) and solving linear programming problems through GAMS Sensitivity analysis in linear optimization and analysis of the results of GAMS (Bazaraa, Jarvis & Sherali, Chapter 6) Modeling of integer and mixed integer programming problems (Wolsey, Chapter 1) and solving these problems through GAMS Introduction to MATLAB and the optimization toolbox Introduction to quadratic programming (Fletcher, Chapter 2) and solving these problems through MATLAB, Markowitz Portfolio Model Introduction to unconstrained non-linear optimization (Fletcher, Chapter 2) and solving these problems through MATLAB Karush-Kuhn-Tucker optimality conditions, Lagrange multipliers, and applications for quadratic programming (Fletcher, Chapter 9) Modeling of stochastic programming problems (Birge & Louveaux, Chapter 1) and solving these problems through GAMS						
	Jersey, 2010 Bertsimas, D., Tsitsil Neural Computation Wolsey, L.A., "Integ Fletcher, R., "Practic Birge, J.R., Louveau Williams, H.P., "Mo	klis, J.N., "Int , Massachuse ger Programm cal Methods c x, F., "Introdi del Building ir	roduction to tts, 1997 ing", Wiley of Optimiza action to S a Mathema	to Linear Op y, New Jerse tion", 2. Ed tochastic Pr tical Program	otimiza ey, 199 ition, V ogram mming	tion", Atl 98 Viley, Ch ming", Sp	hena Scientific Series in Optimization and nichester, 2000 pringer, New York, 1997
	Applied I Modeling IN irements IN	IND371 Irruction French Elective Bachelor Degree This course introduce problems, and the so including linear, non-academic studies and Introduce how to be Enable students to Enable students to Introduction to GAM Modeling of linear properties and solving linear properties and	Applied Mathematical Modeling  IND371  Irrements IND371  ruction  French  Elective  Bachelor Degree  This course introduces several diff problems, and the softwares GAN including linear, non-linear, integer academic studies and in industry. I • Introduce how to build mathema • Enable students to use the software Enable students to analyze and in Introduction to GAMS and solution Modeling of linear programming programming programming programming of integer and mixed integer an	Applied Mathematical Modeling  IND371  Irruction  French Elective Bachelor Degree This course introduces several different types problems, and the softwares GAMS and Maincluding linear, non-linear, integer, etc. The academic studies and in industry. 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Jersey, 2010 Bertsimas, D., Tsitsiklis, J.N., "Introduction to Neural Computation, Massachusetts, 1997 Wolsey, L.A., "Integer Programming", Wiley Fletcher, R., "Practical Methods of Optimiza Birge, J.R., Louveaux, F., "Introduction to Stilliams, H.P., "Model Building in Mathematical Methods of Optimiza Birge, J.R., Louveaux, F., "Introduction to Stilliams, H.P., "Model Building in Mathematical Methods of Optimiza Birge, J.R., Louveaux, F., "Introduction to Stilliams, H.P., "Model Building in Mathematical Methods of Optimiza Birge, J.R., Louveaux, F., "Introduction to Stilliams, H.P., "Model Building in Mathematical Methods of Optimiza Birge, J.R., Louveaux, F., "Introduction to Stilliams, H.P., "Model Building in Mathematical Methods of Optimiza Birge, J.R., Louveaux, F., "Introduction to Stilliams, H.P., "Model Building in Mathematical Methods of Optimiza Birge, J.R., Louveaux, F., "Introduction to Stilliams, H.P., "Model Building in Mathematical Methods of Optimiza Birge, J.R., Louveaux, F., "Introduction to Stilliams, H.P., "Model Building in Mathematical Model Buil	Applied Mathematical Modeling  IND371  Interior French  Elective  Bachelor Degree  This course introduces several different types of mathem problems, and the softwares GAMS and MATLAB, whincluding linear, non-linear, integer, etc. The aim is to intracademic studies and in industry. 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Ed Birge, J.R., Louveaux, F., "Introduction to Stochastic Pr Williams, H.P., "Model Building in Mathematical Program.	Applied Mathematical Modeling  IND371  Irrements IND371  Irrection  French  Elective  Bachelor Degree  This course introduces several different types of mathematical reproblems, and the softwares GAMS and MATLAB, which can including linear, non-linear, integer, etc. The aim is to introduce academic studies and in industry. Hence, the objectives of the continuous including linear, non-linear, integer, etc. The aim is to introduce academic studies and in industry. Hence, the objectives of the continuous integer in the continuous academic studies and in industry. Hence, the objectives of the continuous integer in the continuous academic studies and in industry. 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Birge, J.R., Louveaux, F., 'Introduction to Stochastic Programming for the programming for t	Applied Mathematical Modeling IND371 Irruction French Elective Bachelor Degree This course introduces several different types of mathematical models, v problems, and the softwares GAMS and MATLAB, which can be used including linear, non-linear, integer, etc. The aim is to introduce the logic academic studies and in industry. Hence, the objectives of the course ar Introduce how to build mathematical models of the real-life problems. Enable students to use the softwares GAMS and MATLAB for progr Enable students to analyze and interpret the results of the optimization. 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Edition, Wiley, CH Birge, J.R., Louveaux, F., "Introduction to Stochastic Programming", 6. Edit

## Theory Topics

Week

1	Introduction to GAMS and solution of a simple transportation problem through GAMS
2	Modeling of linear programming problems (Bazaraa, Jarvis & Sherali, Chapter 1, Bertsimas & Tsitsiklis, Chapter 1) and solving linear programming problems through GAMS
3	Modeling of linear programming problems (Williams, Part 2) and solving linear programming problems through GAMS
4	Sensitivity analysis in linear optimization and analysis of the results of GAMS (Bazaraa, Jarvis & Sherali, Chapter 6)
5	Modeling of integer and mixed integer programming problems (Wolsey, Chapter 1) and solving these problems through GAMS
6	Modeling of integer and mixed integer programming problems (Williams, Part 2) and solving these problems through GAMS
7	Introduction to MATLAB and the optimization toolbox
8	Midterm
9	Introduction to quadratic programming (Fletcher, Chapter 2) and solving these problems through MATLAB, Markowitz Portfolio Model
10	Introduction to unconstrained non-linear optimization (Fletcher, Chapter 2) and solving these problems through MATLAB

**Weekly Contents** 

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Introduction to unconstrained non-linear optimization (Fletcher, Chapter 2) and solving these problems through MATLAB

Weekly Contents

- 12 Karush-Kuhn-Tucker optimality conditions, Lagrange multipliers, and applications for quadratic programming (Fletcher, Chapter 9)
- Modeling of stochastic programming problems (Birge & Louveaux, Chapter 1) and solving these problems through GAMS
- Modeling of stochastic programming problems (Birge & Louveaux, Chapter 1) and solving these problems through GAMS