Faculty of Electrical Engineering / /

Course:				
Course ID	**Course status**	**Semester**	**ECTS credits**	**Lessons** (Lessons+Exercises+Laboratory)
13276	Mandatory	3	5	2+1+1

Programs	
Prerequisites	No prerequisites required.
Aims	Through this course, students are introduced to the problem of optimizing the operation of power system operation, optimal units scheduling and methods for their utilization. They also gain knowledge about generation costs and ways to optimize them, optimal reactive power flows and network reconfiguration.
Learning outcomes	Upon successful completion of the course students will be able to: • Understand the problem of optimizing the operation of power system. • Be familiar with methods for optimal utilization of units. • Successfully create optimization functions considering all criteria of interest for optimization. • Be familiar with and model energy production costs. • Understands the process of optimizing reactive power flows, load shedding and network synchronization in power distribution networks. • Utilizes modern software solutions for analyzing power systems. • Possesses the ability to research and present the results of conducted analyses.
Lecturer / Teaching assistant	Vladan Durković, Lazar Šćekić
Methodology	Lectures, exercises, video presentations, computer simulations, consultations.
Plan and program of work	
Preparing week	Preparation and registration of the semester
I week lectures	Economic aspects of power systems exploitation: Generator considerations. Specification of the general problem of unit engagement.
I week exercises	General problem of units’ engagement.
II week lectures	Classical methods for solving the problem of unit engagement: Priority List Method, Dynamic Programming Method
II week exercises	Dynamic Programming Method.
III week lectures	Metaheuristic methods for solving the problem of aggregate engagement: evolutionary algorithms, simulated annealing method, tabu search, particle swarm optimization
III week exercises	Analysis and computer implementation of metaheuristic search methods.
IV week lectures	Production under limited primary energy supply: Special fuel supply contracts. Input – oputput cost functions.
IV week exercises	Production under limited primary energy supply: Special fuel supply contracts. Input – oputput cost functions.
V week lectures	Solution by gradient method. Hard constraints and slow variables. Fuel engagement by Linear Programming method.
V week exercises	Solution by gradient method. Hard constraints and slow variables. Fuel engagement by Linear Programming method.
VI week lectures	Mid-term exam
VI week exercises	Mid-term exam
VII week lectures	Hydro – thermal coordination: Models of hydroelectric power plants. Problems of optimal utilization. Short – term hydro – thermal utilization problem.
VII week exercises	Short – term hydro – thermal utilization problem.
VIII week lectures	Gradient approach to solving the problem of optimal engagement of hydro and thermal units. Cascade hydroelectric power plants. Application of dynamic programming for hydro – electric thermal coordination problem.
VIII week exercises	Application of dynamic programming for the problem of hydro – thermal coordination.
IX week lectures	Cost modeling for budgeting and fuel planning for energy production: Introduction. Types of production cost programs. Probabilistic production cost programs.
IX week exercises	Types of production cost programs. Probabilistic production cost programs.

X week lectures	Economic dispatch taking into account the criterion of operational and safety in interconnection.
X week exercises	Economic dispatch taking into account the criterion of operational and safety in interconnection.
XI week lectures	Optimization of reactive power flows.
XI week exercises	Optimization of reactive power flows.
XII week lectures	Optimization of reactive power flows.
XII week exercises	Optimization of reactive power flows.
XIII week lectures	Optimal plan for load shedding.
XIII week exercises	Optimal plan for load shedding.
XIV week lectures	Optimal reconfiguration of electric distribution networks.
XIV week exercises	
XV week lectures	Analysis of uncertainty in electrical power systems.
XV week exercises	Analysis of uncertainty in electrical power systems.
Student workload	

Per week	**Per semester**
5 credits x 40/30=6 hours and 40 minuts 2 sat(a) theoretical classes 1 sat(a) practical classes 1 excercises **2 hour(s) i 40 minuts** of independent work, including consultations	Classes and final exam: **6 hour(s) i 40 minuts x 16 =106 hour(s) i 40 minuts** Necessary preparation before the beginning of the semester (administration, registration, certification): **6 hour(s) i 40 minuts x 2 =13 hour(s) i 20 minuts** Total workload for the subject: **5 x 30=150 hour(s)** Additional work for exam preparation in the preparing exam period, including taking the remedial exam from 0 to 30 hours (remaining time from the first two items to the total load for the item) **30 hour(s) i 0 minuts** Workload structure: **106 hour(s) i 40 minuts (cources), 13 hour(s) i 20 minuts (preparation), 30 hour(s) i 0 minuts (additional work)**
Student obligations	Students are required to attend classes and to test
Consultations	Every working day from 10 to 12 AM.
Literature	
Examination methods	Compulsory test: 50 points, - Final exam (written + oral): 20+30 points
Special remarks	
Comment	

Grade:	F	E	D	C	B	A
Number of points	less than 50 points	greater than or equal to 50 points and less than 60 points	greater than or equal to 60 points and less than 70 points	greater than or equal to 70 points and less than 80 points	greater than or equal to 80 points and less than 90 points	greater than or equal to 90 points