

Operations Research - opis przedmiotu

Informacje ogólne	
Nazwa przedmiotu	Operations Research
Kod przedmiotu	06.9-WM-MaPE-P-OpeRes-23
Wydział	Wydział Mechaniczny
Kierunek	Management and Production Engineering
Profil	ogólnoakademicki
Rodzaj studiów	pierwszego stopnia z tyt. inżyniera
Semestr rozpoczęcia	semestr zimowy 2023/2024

Informacje o przedmiocie	
Semestr	3
Liczba punktów ECTS do zdobycia	6
Typ przedmiotu	obowiązkowy
Język nauczania	angielski
Sylabus opracował	- prof. dr hab. Taras Nahirnyy - dr inż. Tomasz Belica

Formy zajęć					
Forma zajęć	Liczba godzin w semestrze (stacjonarne)	Liczba godzin w tygodniu (stacjonarne)	Liczba godzin w semestrze (niestacjonarne)	Liczba godzin w tygodniu (niestacjonarne)	Forma zaliczenia
Wykład	30	2	-	-	Egzamin
Projekt	30	2	-	-	Zaliczenie na ocenę

Cel przedmiotu

Transfer of basic knowledge and acquisition by students of skills and competences in the field of operations research, which will be used in the further education process and useful in future professional work.

Wymagania wstępne

Basic Mathematics Course, Information Technology.

Zakres tematyczny

Lecture content

- L1. Preliminary issues. Basic elements and problems of operational research. Linear programming problem. Geometric method of solving the problem LP.
- L2. Simplex method.
- L3. Two-phase method and Big M method. Problems with Simplex.
- L4. Duality and sensitivity analysis. The Dual Simplex Method.
- L5. The Transportation Problem.
- L6. The Assignment and Traveling Salesman Problems.
- L7. Integer Programming. Gomory's cutting plane algorithm and the Branch-and-Bound Technique.
- L8. Network analysis. Basic concepts of graphs. The Terminology of Networks.
- L9. Shortest Path Method. Applications in technology.
- L10. Project management technique. Critical path method. CPM and the Gantt chart.
- L11. Time-cost analysis. PERT method. Computer aided network analysis.
- L12. Components and classification of queuing systems. Kendal notation. Little's laws. Rate diagram for the birth and death process. Laws for constructing a system of equations.
- L13. A single-channel system with an exponential distribution of service time and the arrival strems. Applications.
- L14. Multi-channel system with a simple fluxes. Simple Streams. Applications.
- L15. Computer-aided research of queuing systems. Final remarks.

Project

P1. Presentation of the course program, learning outcomes and assignment conditions. Characteristics of individual topics carried out during the project classes.

P2-3. Geometric method of solving the linear programming problem.

P4-9. Simplex Methods - maximisation and minimisation case, simplex algorithm, dual simplex method, big M method. OFC (Objective Function Coefficient) and RHS (Right Hand Side) sensitivity analysis. Integer programming.

P10-11. The transportation problem, formulation and types. The transportation problem, formulation and types. Methods of generating the basic solution. Optimization of the basic solution. Degeneracy in the transportation problem.

P12. The assignment problem.

P13-14. Project planning and scheduling - CPM and PERT techniques.

P15. Summary of completed problems. Completion of the project classes.

Metody kształcenia

Conventional lecture..

Project - individual and group work of students using literature and lecture notes.

Efekty uczenia się i metody weryfikacji osiągnięcia efektów uczenia się

Opis efektu	Symbole efektów	Metody weryfikacji	Forma zajęć
The student has knowledge of linear and integer programming, network methods and queuing systems, useful for formulating and solving simple tasks in the field of Production Engineering	• K_W02	• egzamin - ustny, opisowy, testowy i inne • obserwacja i ocena aktywności na zajęciach • praca pisemna	• Wykład • Projekt
The student is able to make a preliminary economic analysis of undertaken engineering activities on the basis of solutions to the relevant issues of operational research	• K_U20	• egzamin - ustny, opisowy, testowy i inne • praca pisemna	• Wykład • Projekt
The student is able to cooperate and work in a group	• K_K03	• aktywność w trakcie zajęć	• Projekt
The student has knowledge of operations research and numerical methods useful for formulating and solving simple tasks related to Management and Production Engineering.	• K_W06	• bieżąca kontrola na zajęciach • egzamin - ustny, opisowy, testowy i inne • praca pisemna	• Wykład • Projekt
The student is able to obtain information from the literature and other properly selected sources, is able to integrate the information obtained, and to interpret it	• K_U01	• obserwacje i ocena umiejętności praktycznych studenta	• Projekt
The student is able to prepare a well-documented study in Polish on the use of operations research in the issues of Production Engineering	• K_U05	• praca pisemna	• Projekt
The student understands the need for lifelong learning	• K_K01	• obserwacja i ocena aktywności na zajęciach	• Projekt

Warunki zaliczenia

Lecture: exam

Grade based on a written exam that verifies the knowledge of basic issues.

Project: graded credit

The grade is determined on the basis of the component evaluating skills related to the implementation of project tasks, preparation of reports and the component for "defense" by the student of individual reports.

Final grade - arithmetic average of grades from the above-mentioned forms of classes.

Literatura podstawowa

1. Hillier F.S., Lieberman G.J., Introduction to Operations Research, McGrawHill
2. Nick T. Thomopoulos. Fundamentals of Queuing Systems. Statistical Methods for Analyzing Queuing Models, Springer, 2012
3. Sharma, S. C. *Operation research: Pert, Cpm & cost analysis*. Discovery Publishing House. 2006
4. Help materials for selected computer programs

Literatura uzupełniająca

Uwagi

Zmodyfikowane przez dr inż. Tomasz Belica (ostatnia modyfikacja: 12-05-2023 18:29)

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