

**Ministry of science and education of Ukraine
Government institute of higher education
«National mining university»**

Department of system analysis and management



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**LABOUR EDUCATIONAL SCHEDULE OF THE DISCIPLINE
BK7 «Games theory in examination of conflict situations»
For masters of specialty №124 «System analysis»**

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@ The Department of System Analysis and Management, 2017*

Kogut O.P. Educational programme for discipline BK«Games theory in examination of conflict situation» for masters of № 124 specialty«System analysis»

Overviewed and approved by methodological commission for №124«System analysis»by the request of the department of system analysis and management

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INTRO

Programme results of the master's preparation of system analysis are marked in the higher educational standard for №124 System analysis.

In the educative professional schedule of the Government HEI «NMU» realized a division of programme educational results of studying with organization forms of educational process. For the «Games theory in examination of conflict situations» discipline required such kinds of competence and educational skills.

ΦK1 – An ability to create and analyse mathematical models of nature ,technologies ,economical and social subjects and processes;

ΦK2 – An ability to plan and build systematic researches ,perform mathematical and informative modelling of dynamical processes;

ΦK4 – An ability to form new hypotheses and explorational tasks in system analysis' sphere and acceptance of the decisions ,choose the appropriate ways for their usage.;

ΦK12 - An ability to solve situational and systematic uncertainties, to create algorithms of overcoming the conflicts;

ΠPH2 – To know methods of finding uncertainties in system analysis', be able to solve situational uncertainties, and uncertainties in the cooperative tasks, resistance for conflict strategies , to find a compromise while solving conceptual uncertainty and so on;

ΠPH6 – To be able to use methods of evolutionary modelling and genetic methods of optimization , optimization methods ,methods of the inductive modelling and mathematical instrument of the undefined logic, neuron networks , theories of the games and assigned artificial intelligence ;

ΠPH9 To know models , methods and algorithms of decision acceptance in conflict conditions ,undefined information , uncertainty and risk;

ΠPH10 –To know models ,methods and algorithms of decision acceptance in conflict conditions ,undefined information ,uncertainty and risk;

PHC3 To know how to build typical mathematical models of subjects and processes of system analysis ,to use mathematical methods and algorithms of data editing(statistical ,mathematical ,combined ,theoretically informative and others;

Besides marked professional results of education whilst studying the discipline bachelor has to become proficient these common results of studying:

3PH2 To know how to search the information in the specified literature in the system analyses' sphere while using different resourses like: magazines ,data bases , online resourses;

3PH3 To know how to do a data handling ,analysis , systemization of scientific and technological information ,to sum up the latest scientific skill in system analysis of his homeland or other foreign countries;

3PH4 To develop and use his own artistic skills in professional area ,organize the working area and manage the working time;

3PH5 To show curiosity ,inclination for risk ,ability to think , inspire new ideas and make them become a reality , to entice people of your surrounding with your ideas , to mix and take a shot;

The aim of the discipline «Games theory in examination of conflict situations» is formation of students' theoretical knowledge and practical skills ,formalization of the behavior of the conflict participant ,using the games theory in different areas :political ,social, economical, technical ,for the analysis of subject cooperation , exploration and finding the optimal way of gamblers' behavior.

Realization of the aim demands transformation of programmes' results of the studying into disciplinarian and selection of content of the studying discipline by this criterion .

Demands of the structure for the workers of the disciplinarian programme is lined in [2.5].

1 AREA OF USAGE

Working programme is made for

- Realization of competent approach while forming the structure and the content of the discipline;

- Internal and outer quality control of the masters;
- Accreditation of the educational schedule by the speciality.

A working schedule states:

- The amount and terms of teaching the discipline;
- Marking of physical constants;
- Disciplinary results of the teaching and their levels of difficulty;
- Thematical plan and the assesstment coverage by the organization forms of the educational processes;
- Demands for the structure and the contest of the individual task;
- Tasks for the contestants' individual work;
- Summarized methods of diagnostic ,criteria and procedures of estimation of educational achievements of the contestant;
- Structure of the complex of the educational and methodical provision for the discipline.

2 NORMATIVE REFERENCES

Working schedule of the discipline is created on the basis of such normative documents:

2.1 The preparation schedule of education for the bachelor degree by the №124 speciality «System analysis» Ministry of education and science of Ukraine ,National Mining University – D. : NMU, 2017. – 23 c.

2.2 Resolution of the Minister Cabinet of Ukraine from 30th of December 2015 year №1187 Licensed conditions for providing an educational activity educational institutions (resolution from MC of Ukraine from 30th of December 2015 year).

2.3 Project of standard for higher educational preparation for the bachelor degree №124 speciality system analysis.

2.4 Ukrainian law «About higher education».

2.5 Standard of higher education of the Government HEI «NMU» The procedure of creating the educational process. Dnipro: NMU ,2016 – 74 c.

3 THE AMOUNT AND TERMS OF PREPARATION THE DISCIPLINE

Overall amount – 3 credits ECTS (90 academic hours).

Is taught on the 5th course , in the I-st semester, in the 1-st (7 weeks) and 2-nd quarters (6 weeks).

4 MARKING OF THE PHYSICAL CONSTANTS

$x(t)$ – vector which describes the condition of the system;

$u(t)$ – speed vector;
 $H(t)$ –hamiltonian.

5 EXPECTED DISCIPLINARY RESULTS OF EDUCATION

Cypher and content of results for the educational professional schedule	Cypher and content of disciplinarian results of education (DRE)
1	2
IIPH2 – To know methods of uncertainty in system analytics' tasks , to know how to solve situational uncertainties and also uncertainties in cooperative tasks ,resistance and conflict strategies , to find a compromise while solving conceptual uncertainty ;	DRE2-1 Compose mathematical models of conflict situations
	DRE2-2 Classify conflict situations by using an appropriate mathematical instrument for description and exploration.
IIPH6 To know and be able to use methods of evolutionary modelling and genetic methods of optimization ,methods of inductive modelling and mathematical instrument of undefined logic ,neuron networks ,games theory and divided artificial intelligence	DRE6-1 Know how to figure out features of natural,social and economical and ecological processes by using the knowledge of the basis methods of system analysis , which are liable to exploration and automation .
	DRE6-2 Explore mathematical subject models and processes with analytics skills in order to find whether they exist and if they have common solvation.
	DRE6-3 To be a master at method theories of differentiate games .To be accurate , to able to solve tasks of pursuit ,parallel approaching and so on.
IIPH9 To know models ,methods and algorithms of decision acceptance in conflict conditions of undefined information ,uncertainty and risk.	DRE9-1 To identify settings of the mathematical model , to analyse the adequacy of the model in the real conflict by using analytical methods of games' solvation
	DRE9-2 To construct mathematical models of cooperative games ,extensive games and not extensive.
	DRE9-3 To know search methods of the optimal and effective strategies in conflict situations
IIPH10 Ability to do an information research in specified literature area of system analysis ,by using different resources like: magazines ,data bases , online resources.	DRE10-1 To construct mathematical models of the game theory.
	DRE10-2 To buid and use reasonable and optimal or effective strategies.
	DRE10-3 Become proficient in specialized literature connected with the newest researches about the games' theory.

PHC3 To know how to build typical mathematical models of objects and processes of system analysis , use mathematical methods and data processing (statistical ,mathematical, mixed ,theoretically-informational)	ДНС3-1 To build mathematical models which look like a matrix game ,extensive ,cooperative and differential games.
	ДНС3-2 To solve tasks of game theory with the help of appropriate methods.

6 THEMATIC PLAN AND ASSIGNMENT OF THE AMOUNT OF THE DISCIPLINE BY THE SPECIES OF EDUCATIONAL LESSONS

Cypher ДPH	Вид та тематика навчальних занять	Amount, hour		
		ауд	CPC	overall
1	2	3	4	5
	lectures	26	20	46
ДРН2-1	1. Conflict.Managment in conflict conditions and uncertainty. Modelling of conflicts and game theory. Game classification.	2	1	3
ДРН6-1, ДРН10-2	2. Games in the usual form. Examples of conflict situations which are modelled by games in the usual form.	2	1	3
ДНС3-1	3. Matrix games.Optimization of the processes in conflict situations. Maximum mini and mini maximum strategies.	2	1	3
ДРН9-1	Games in the positional form. Games with full information. Reduction of the positional games to the usual form	2	1	3
ДРН2-1 ДНС3-1	Mixed resolution of the game. Existence of solvation of the matrix game in the mixed strategy class.	2	1	3
ДРН6-3, ДРН10-2	6. Optimal solvation of bimatrixial games in mixed strategies. Examples of tasks	2	1	3
ДРН9-2	7.Uncooperative and cooperative behavior. Optimal principals .Neshu equilibrium , Pareto optimal solvations..	2	2	4
ДРН2-1, 2 ДНС3-1	8. Examples of finding balance Neshu and optimal Pareto solvation in conflict situations . Dominative and not dominative strategies.	2	2	4
ДРН10-3 ДНС3-1	9. Cooperative games. Function characteristics . Equivalence of cooperative games. Division in cooperative game. Optimal principals in cooperative games.	2	2	4
ДРН6-2, ДРН10-1	10. S-core of the cooperative game .Shepli Vector. N-core. Example of theoretically-gaming point of view on the analysis of conflict situation.	2	2	4
ДРН9-3	11. Basics knowledge of the differential games. Examples of the tasks.	2	2	4
ДРН2-2	12.Pursuit games. Games with simple movement on the flatness. Strategy of the parallel approach.	2	2	4
ДРН9-3 ДНС3-1	13. Differential games for many players.	2	2	4
	Lab researches	14	30	44

Cypher ДРН	Вид та тематика навчальних занять	Amount, hour		
		ауд	CPC	overall
1	2	3	4	5
	lectures	26	20	46
ДРН2-1	1. Conflict.Managment in conflict conditions and uncertainty. Modelling of conflicts and game theory. Game classification.	2	1	3
ДРН6-1, ДРН10-2	2. Games in the usual form. Examples of conflict situations which are modelled by games in the usual form.	2	1	3
ДНС3-1	3. Matrix games.Optimization of the processes in conflict situations. Maximum mini and mini maximum strategies.	2	1	3
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ДРН2-1, 2 ДНС3-1	8. Examples of finding balance Neshu and optimal Pareto solvation in conflict situations . Dominative and not dominative strategies.	2	2	4
ДРН10-3 ДНС3-1	9. Cooperative games. Function characteristics . Equivalence of cooperative games. Division in cooperative game. Optimal principals in cooperative games.	2	2	4
ДРН6-2, ДРН10-1	10. S-core of the cooperative game .Shepli Vector. N-core. Example of theoretically-gaming point of view on the analysis of conflict situation.	2	2	4
ДРН9-3	11. Basics knowledge of the differential games. Examples of the tasks.	2	2	4
ДРН2-2	12.Pursuit games. Games with simple movement on the flatness. Strategy of the parallel approach.	2	2	4
ДРН9-3 ДНС3-1	13. Differential games for many players.	2	2	4
ДРН10-1	1. Conflict situations and matrix games.	2	4	6
ДРН2-1	2.Brown-Robinson method of solving the matrix games.	2	4	6
ДРН2-2 ДНС3-1	3. Diagramic and analytical method of matrix games solvation.	2	4	6
ДРН6-1	4. Cooperative games desicions	2	4	6
ДРН9-3	5. Positional games.	2	4	6
ДРН10-2 ДНС3-1	6.Parallel approach strategies ,simple pursuit on the flatness	2	5	7
ДРН10-1	7. Differential games for many players. Диференціальні ігри багатьох гравців	2	5	7
	Altogether	40	50	90
	Lectures (chair - 2 hours per week)	26	20	46
	Lab researches (chair - 1 hour per week)	14	30	44
	Summarising (semester) control –Differential exam: I semester, 2 quarter			

7 DEMANDS FOR THE INDIVIDUAL TASKS

While studying the discipline the individual tasks fulfilment is provided. The individual task ought to be done accordingly to the methodical recommendations [15].

The aim of the task:

- 1) general conclusion of competences gained through the time of education;
- 2) development of an ability to use the knowledge of the discipline for creating an appropriate solution in the conflict situations.
- 3) gathering the abilities of calculating the game settings.

Below is the list of the things that must be done when the student have watched the task:

- 1) create a mathematical model of the conflict situation;
- 2) to solve the task;
- 3) mark the optimal gamblers strategies which provide guaranteed wins.

When the task is being estimated next factors are summarized :

- Used methods;
- Correctness and completeness of the tasks' solution;
- Grammatical correctness ,laconism and logical sequence of the presentation;
- An ability to use ECM for the task solution;
- Appropriate design of the explanatory list and scheduled time of its' receiving;
- Individual completeness (diagnosed while presented).

8 STUDENTS' INDIVIDUAL TASKS

Basic tasks for the individual lab research are presented below:

- Beforehand acquaintance with the informational provision for each theme;
- Preparation for the line control – solution of the exam tasks by every theme;
- Completeness of the individual task;
- Preparation for the presentation of the individual task;
- Preparation for the general conclusion (semester) control.

9 FORM OF THE GENERAL CONCLUSION CONTROL ,MEANS OF DIAGNOSIS ,CRITERIONS AND PROCEDURES OF ESTIMATION

9.1 Form of the general control

Form of the general conclusion – differential exam.

Estimation of the disciplines' competences levels of formation also may be done without the presence of the student ,oriented on the results of the line control.

9.2 Forms of the line control

Definition of the formation level of disciplines' results of the education while the line control is done by :

- An appropriate part of the working disciplines' programme;
- Lab researches (checking and presentation);

9.3 Means of diagnosis

9.3.1 Generalized means of diagnosis

Means of diagnosis are completed in the way of theoretical questions and exact tasks with numbered data, that means are created to estimate the students' ability :

- To differentiate, solve integrals and unification ;
- To use the rules, methods, principals and laws in specific situations;
- To interpret schemes, diagrams and schedule;
- To analyse and estimate facts, events and make predictions for the expected results out of the accepted decisions;
- To write the material on the list with logic, sequence and keep the demands of activated standards.

9.3.2 Accurate means of diagnosis

Exact means of diagnosis which are used for the examination events during the lectures, are formed on the basis of summarized numbers or other accurate facts which are presented in the way of closed or opened texts.

9.4 Criteria and procedures of estimation

9.4.1 Lecture material

Results estimation of the completed tasks is made by comparing the estimated work to the standard – examples of the correct and fully completed answers by finding the formation level of the competences on the basis of students' answer analysis and with the use of coefficient of consuming conducted in percents which adapts meaning of the mark to the scale *ECTS*:

$$P_i = a / m (\%),$$

a is the number of the correct answers or completeness of significant operations which are close to the standard; m – is summarized amount of questions or significant operations of the standard decisions.

Gained results of the students' achievements (in percents) teacher writes in the *ECTS* grades and national scale:

Achievement level/Marks, %	Оцінка / Grade
National differential scale	
90-100	Відмінно/Excellent
74-89	Добре/ Good
60-73	Задовільно/ Satisfactory
1-59	Незадовільно/ Fail

ECTS scale	
90-100	A
82-89	B
74-81	C
64-73	D
60-63	E
35-59	Fx
1-34	F

If a student's level of achievements is fixed below 60% or if a student has not come for the examination event, then he/she gets an «Fx» and «fail» marks. In such cases student must study the failed subject additionally and then complete a second time estimation of his educational skills.

9.4.2 Lab researches

Every lab research is estimated by quality of report with the help of coefficient ,becoming a master in the subject or by an expert method ,maximum grade can be reached when following conditions are remained:

- Correspondence of report about completing the lab research via methodical recommendations;
- Correctness of completeness
- Becoming a master in theoretical knowledge on which the subject is based;
- Knowing the methods of experimental researches;
- General and professional grammatical correctness ,laconism and logical sequence of presenting the material;
- Correctness of the design of the report that is based on a standard.
- References to the sources of information;
- Individuality of doing the task (is being figured out while presented to the headmaster).

Achievements level of the lab research is conducted as an average of the results of the line control.

When lab is being checked the percentage of correct steps and algorithms of the lab define the mark.

Integral mark of the labs' achievements is accepted positive (when level of students' achievements is not below 60% or not less than 60 marks) only in case when all the provided labs are done and checked.

9.4.3 Integral level of students' acknowledge

Integral level of students' achievements in studied material from the discipline is conducted as an average from level of formation of competences ,lecture , practical and lab tasks:

$$IP = \sum_{i=1}^n \frac{(P_i \times T_i)}{T}, \%,$$

n – number of species of studied lessons;

P_i – achievements level by *i*-kind of lessons, %;

T_i – amount of *i*- kind of lessons;

T – overall amount of the discipline.

Students' achievements can not be estimated positive if he/she did not get a positive mark from any planned exam.

If the mark of the line control is higher than 60% than grade «Satisfactory» is marked(using the international gradation scale).

If the result of any line control exam is lower than 60% than student gets mark «Fx» and if he/she gets a result below 35%than mark «F» Transferring to the national scale that means «fail».

10 CONTENT OF METHODOICAL PROVISION OF THE DISCIPLINE

Content of the educational and methodical provision of the discipline must be placed on a system analysis and management chair site and must consist of:

- 1) working programme of the discipline;
- 2) tutorial content (informational provision of lectures);
- 3) tasks and methodical provision for lab researches;
- 4) materials of methodical provision for individual task about:
 - previous learning of informational provision from lectures;
 - solvation of every task of self-check by every theme
 - completeness of individual task;
 - preparation for presentation of the individual task;
- 6) summarized tasks for the line control of formation disciplined competences level in the form of typical situational exercises with solvation examples;
- 7) tasks for after-gradational monitoring of formation disciplines competences levels.

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