

## GDAŃSK UNIVERSITY

## Subject card

Field of study     Nuclear Engineering       Date of commencement of studies     February 2028     Academic year of realisation of subject     2026/2027       Education level     second-cycle studies     Subject group     Specialty subject group related to as or research in the field of stud       Mode of study     Full-time studies     Mode of delivery     at the university       Year of study     1     Language of instruction     Polish       Semester of study     2     ECTS creditis     2.0       Learning profile     general academic profile     Assessment for     assessment       Conducting unit     Division of Heating Vertilation Air Conditioning and Refrigeration -> Institute of Energy -> Faculty of Mechanical Engineering and Stip Technology -> Wydraby Politechnic Guaristice       Lesson types and methods of instruction     Lesson type     Lecture     Tutorial     Laboratory     Project     Seminar     SUM       Learning activity and number of study hours     Learning activity     Participation in consultation hours     Self-study     SUM       Subject objectives     Education of students in the field of thermohydraulic issues of nuclear reactors.     SUM       Learning outcommes     Course outcomme     Subject o	Subject name and code	Thermohydraulics of	nuclear reactor	s, PG_000658	99				
Date of commencement of studies     February 2026     Academic year of realisation of subject     2026/2027       Education level     second-cycle studies     Subject group     Subject group     Subject group     Subject group       Mode of study     Full-time studies     Mode of delivery     at the university     Periate to so research in the field of stud       Semester of study     1     Larguage of instruction     Polish       Conducting unit     Oneston of Heating Ventilation Air Conditioning and Perforgaration -> Institute of Energy >> Faculty of Mechanical Engineering and Ship Technology >> Wydziky Politichniki Gdańskie       Name and sumame of lecturer (lecturers)     Subject supervisor     dr hab. inz. Jan Wajs     Ereson types and methods to instruction     Lesson types and methods     Lesson types and methods     Lesson types and methods     Subject objectives     Subject objectives     Subject outcome     Subject outcome     Subject outcome     Subject outcome     Subject outcome     Method of ventilcalin para     Subject outcome     Subject outcome <td< td=""><td>, , , , , , , , , , , , , , , , , , ,</td><td>Nuclear Engineering</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>	, , , , , , , , , , , , , , , , , , ,	Nuclear Engineering							
Conjust group     Subject	Date of commencement of	February 2026				2026/2027			
Nonce of bodies     Poilsh       Year of study     1     Language of instruction     Poilsh       Semester of study     2     ECTS credits     2.0       Learning profile     general academic profile     Assessment form     assessment       Conducting unit     Division of Heating Ventilation At Conditioning and Refrigeration -> Institute of Energy -> Faculty of Mechanical Engineering and Ship Technology -> Wydzialy Politechniki Gdardskie       Name and sumame     Studject supervisor     dr hab. inz. Jan Wajs     Teachers       Lesson types and methods     Lesson type     Lecture     Tutorial     Laboratory     Project     Seminar     SUM       Number of study hours     Learning hours included: 0.0     0.0 <td>Education level</td> <td colspan="2">second-cycle studies</td> <td colspan="3"></td> <td colspan="3">Specialty subject group Subject group related to scientific research in the field of study</td>	Education level	second-cycle studies					Specialty subject group Subject group related to scientific research in the field of study		
Semester of study     2     ECTS credits     2.0       Learning profile     general academic profile     Assessment form     assessment       Conducting unit     Division of Heating Ventilation Air Conditioning and Refrigeration >> Institute of Energy >> Faculty of Mechanical Engineering and Ship Technology -> Wycziay Politechnik Gdanskie)       Name and surmame of lecturer (lecturers)     Subject supervisor     dr hab. in2. Jan Wajs     Teachers       Lesson types and methods     Lesson types included: 0.0     Learning activity     Learning activity     Participation in didactic plan     Sulf       Learning activity and number of study hours     Education of students in the field of thermohydraulic issues of nuclear reactors.     Sulf (St) Assessment of ability solve problems that arise in consultation hours     Self-study     SUM       Subject objectives     Education of students in the field of thermohydraulic issues of nuclear reactors.     Subject outcome     Method of verification of acquired knowledge in student son work, using reliable solve problems that arise in solving difficulties with individual problem achines of an uclear power plant     [SV1] Assessment of facuation and materials for reactors, systems and devices of nuclear power plant mathematical models to analysis of selection and analytical, simulation, and exprired to processes in nuclear fractors work and materials for reactors, systems and devices of nuclear power plant derergy components of a nuclear fractors mathematical models to analysis of s	Mode of study	Full-time studies							
Construction     Construction     essessment       Learning profile     general academic profile     Assessment form     essessment       Conducting unit     Division of Heating Ventilation Air Conditioning and Refrigeration 3- Institute of Energy -> Faculty of Mechanical Engineering and Ship Technology -> Wydziaky Politechniki Gdariskiej       Name and surname of lecturer (lecturers)     Subject supervisor     dr hab. inz. Jan Wajs       Lesson types and methods     Lesson type     Lecture     Tutorial     Laboratory     Project     Seminar     SUM Notars       Learning pours included: 0.0     D     0.0	Year of study								
Conducting unit     Division of Heating Ventilation Air Conditioning and Refrigeration >> Institute of Energy -> Faculty of Mechanical Engineering and Ship Technology -> Wydziały Politechniki Gdańskiej       Name and surname of lecturer (lecturers)     Subject supervisor     dr hab. inz. Jan Wajs       Lesson types and methods of instruction     Lesson type     Lecture     Tutorial     Laboratory     Project     Seminar     SUM       Learning activity and number of study hours     Learning activity learning activity     Learning activity pain     Participation in classes included in study plan     Participation in classes included in study plan     Self-study     SUM       Subject objectives     Education of students in the field of thermohydraulic issues of nuclear reactors.     Self-study     SUM       Learning outcomes     Course outcome     Subject outcome     Method of verificator of nicical verification of acquired inficulties with individual problem solving     Subject outcome     Swipe problems that arise in practice     Swipe problems that arise in practice       Virg. Y011 explains and describes, based on general knowledge in the physics of processes, structure Power Technologies, the physics of processes, fuels and realiste for reactors, systems, machines and devices of a nuclear power plant     Is able to use the laws of physics learned in the analysis of selected analysis disected in dustries and realise for reacords, systems, machines and devices of a nuclear power p	Semester of study								
Mame and sumame of lecturer (lecturers)     Subject supervisor     dr hab. in2. Jan Wajs       Lesson types and methods of instruction     Lesson type     Lecture     Tutorial     Laboratory     Project     Seminar     SUM       Learning activity and number of study hours     Learning activity     Participation in didactic plan     Participation in didactic consultation hours     Self-study     SUM       Subject objectives     Learning activity and number of study hours     Learning activity plan     Participation in didactic consultation hours     Self-study     SUM       Subject objectives     Education of study hours     30     5.0     15.0     50       Subject objectives     Education of study hours     30     5.0     15.0     50       Learning outcomes     Education of study protessional acting, the need for critical verifies acquired rinowidege and consulting experi- ophion in case of facquired romedificulty erifies the results of of notessional acting, the need for student own work, using reliable sources of information     SW1 Assessment of facture sources of information     SW1 Assessment of facture invowidege and consulting experi- sources in general knowledge in the field of scientific disciplines forming the theoretical foundegies, the physics of processes, systems, machines and devices of a nuclear reactors, systems, machines and devices of a nuclear reactors, systems, machines and devices o	Learning profile								
of lecturer (lecturers)     Teachers       Lesson types and methods of instruction     Lesson type     Lecture     Tutorial     Laboratory     Project     Seminar     SUM       Number of study hours     15.0     0.0     0.0     0.0     0.0     30       Learning activity and number of study hours     Learning activity     Participation in didactic classes included in study plan     Participation in consultation hours     Self-study     SUM       Subject objectives     Education of students in the field of thermohydraulic issues of nuclear reactors.     Subject outcome     Method of verification of professional acting, the need for oritical verification of acquired knowledge and consulting experts opinion in case of facing difficulties with individual problem solving     ISAU Assessment of factua knowledge     ISAU Assessment of factua knowledge       If (7_VU1) explains and describes, based on general knowledge in the field of scientific diopines forming the theoretical foundations of Nuclear Power Technologies, structure, principle of operation, operation, safety aspects, tuels and materials for reactors, systems, machines and describes, structure, principle of operation, operation, safety aspects, tuels and anterials or reactors     Is able to use the laws of physics learned in the analysis of selected thermohydraulic processes in nuclear reactors     ISU2] Assessment of taking in nuclear power selor and related industries       Subject contents     Recture: thermody	Conducting unit	Division of Heating Ventilation Air Conditioning and Refrigeration -> Institute of Energy -> Faculty of							culty of
Lesson types and methods of instruction     Lesson type     Lecture     Tutorial     Laboratory     Project     Seminar     SUM       Mumber of study and number of study hours     Learning hours included: 0.0     15.0     0.0     0.0     0.0     0.0     30       Learning activity and number of study hours     Learning activity plan     Participation in didactic classes included in study plan     Participation in consultation hours     Self-study     SUM       Subject objectives     Education of students in the field of thermohydraulic issues of nuclear reactors.     Self-study     SUM       Learning outcomes     Course outcome     Subject outcome     Method of verification critical verification of acquired knowledge and consulting experis- opinion in case of facing difficulties with individual problem solving     IK7_V11 is aware of importance of professional acting cloundations on general knowledge in the field of scientific disciplines forming the theoretical foundations of Nuclear Power Technologies, the physics of processes, structure, principle of operation, operation, safety aspects, fuels and materials for reactors, systems, machines and devices of a nuclear power sects or and related industries     Is able to use the laws of physics learned in the analysis of selected thermohydraulic processes in nuclear reactor     SU2] Assessment of tability analyse information (SU1] Assessment of tability analyse information       Subject contents     Reture, thermodynamic aspe									
of instruction   Number of study hours   15.0   15.0   0.0   0.0   0.0   30     Learning activity and number of study hours   Learning activity plan   Participation in didactic classes included in study plan   Participation in classes included in study plan   Participation in consultation hours   Self-study   SUM     Subject objectives   Education of students in the field of thermohydraulic issues of nuclear reactors.   Education of acquired for professional activity plan   Subject outcome   Method of verification (SK5) Assessment of ability or ticleal verification of acquired for professional activity experts ophion in case of facing difficulties of on general knowledge in critical verification of acquired formation   defines the principles of conservation of mass, momentum, and energy, explains the mechanisms of heat transfer in knowledge   [SW1] Assessment of facture knowledge     [K7_U01] utilizes acquired an alytical, simulation, and experimental methods, as well as and materials for reactors, systems, machines and devices of a nuclear power plant   is able to use the laws of physics and energy, explains the mechanisms of heat transfer in knowledge   [SU2] Assessment of ability analyse information     Subject contents   Subject contents   is able to use the laws of physics and evaluate processes coruring in nuclear power plant   is able to use the laws of physics and evaluate processes coruring in nuclear reactor, heat conduction in the elements, heat transfer and hydraulic resistance coolant flow under single-phase forced convection o coolant, sheat t	of lecturer (lecturers)	Teachers	I		1	-			
hours     Learning hours included: 0.0       Learning activity and number of study hours     Learning activity Patricipation in didactic classes included in study plan     Participation in didactic classes included in study plan     Setf-study     SUM       Subject objectives     Education of students in the field of thermohydraulic issues of nuclear reactors.     Solicit context     Method of verification of professional acting, the need for critical verification of acquired knowledge and consulting experts option in case of facting difficulties with individual problem for Mulear Power Technologies, the physics of processes, structure, principle of opcesses, the physics of processes, the physics of processes, structure, principle of opcesses, and materials for reactors, systems, machines and describes and materials for reactors, systems, machines and describes and vealuate processes corumn in nuclear power plant     ISU2 Assessment of facture knowledge       Subject contents     Subject contents     Is able to use the laws of physics and materials for acquired inclear prover sector and related industries to analyse and wealuate processes of an uclear power plant     ISU2 Assessment of facture knowledge       Subject contents     Subject contents     Is able to use the laws of physics in nuclear power sector and related industries for reactors, system thermatical models to analyse and experimental methods, as well as mathematical models to analyse and evaluate processes of an related industries     Is able to use the laws of physics is able to use the laws of physics and sective thermodynamic aspects of nuclear powere plant operation, coolants and their properties, heat sources i					, , , , , , , , , , , , , , , , , , ,		t		SUM
Learning activity and number of study hours     Learning activity plan     Participation in didactic classes included in study plan     Participation in consultation hours     Self-study     SUM       Subject objectives     Education of students in the field of thermohydraulic issues of nuclear reactors.     Iso     50       Learning outcomes     [K7_K11] is aware of importance of professional acting, the need for critical verification of acquired knowledge and consulting experts opinion in case of facing difficulties with individual problem solving     certically verifies the results of student own work, using reliable sources of information     [SK5] Assessment of ability solve problems that arise in practice       [K7_W10] explains and describes, based on general knowledge in the field of scientific disciplines forming the theoretical foundations of Nuclear Power Technologies structure, principle of operation, operation, safety aspects, fuels and materials for reactors, systems, machines and devices of a nuclear power plant     is able to use the laws of physics the physics of processes, structure, principle of operation, operation, safety aspects, fuels and materials for reactors, systems, machines and devices of a nuclear power sector and related inclustries     is able to use the laws of physics the physics of processes occurring in nuclear power sector and related inclustries     [SU2] Assessment of ability analyse information [SU1] Assessment of task tufilment       Subject contents <i>Ecture</i> : thermodynamic aspects of nuclear reactor, sources in a nuclear power sector and related inclustries     is able to use the laws of physics teared in the analysics of	of instruction	hours		15.0	0.0	0.0		0.0	30
and number of study hours     classes included in study plan     consultation hours       Number of study hours     30     5.0     15.0     50       Subject objectives     Education of students in the field of thermohydraulic issues of nuclear reactors.     Method of verification of professional acting, the need for student own work, using reliable sources of information     Method of verification of professional acting, the need for student own work, using reliable sources of information     Subject outcome     Method of verification of student own work, using reliable sources of information       [K7_W01] explains and describes, based on general knowledge in solving     defines the principles of conservation of mass, momentum, in the field of scientific disciplines forming the theoretical foundations of Nuclear Power Technologies, the physics of processes, structure, principle of operation, operation, safety aspects, fuels and metrials for reactors, systems, machines and devices of a nuclear power plant     is able to use the laws of physics and evaluate processes occurring in nuclear power sector and related industries     [SU2] Assessment of tability analyse information       Subject contents <i>lecture:</i> thermodynamic aspects of nuclear power plant     is able to use the laws of physics and evaluate processes occurring in nuclear power sector and related industries     is able to use the laws of physics and evaluate processes occurring in nuclear power sector and related industries     [SU2] Assessment of task fulfilment       Subject contents <i>lecture:</i> thermodynamic aspects of nuclear p		-							
hours     Learning outcomes     Education of students in the field of thermohydraulic issues of nuclear reactors.       Learning outcomes     Course outcome     Subject outcome     Method of verification       [K7_K11] is aware of importance of professional acting, the need for critical verification of acquired knowledge and consulting experts opinion in case of facing difficulties with individual problem solving     Sk5] Assessment of ability solve problems that arise in practice       [K7_W01] explains and describes, based on general knowledge in the field of scientific disciplines of Nuclear Power Technologies, the physics of processes, structure, principle of operation, operation, safet sapects, systems, machines and devices of a nuclear power plant     defines the principles of nuclear power plant     [SW1] Assessment of facture knowledge       [K7_U01] utilizes acquired analytical, simulation, and experimental methods, as well as mathematical models to analyse and evaluate processes courring in nuclear power sector and telated industries     is able to use the laws of physics is able to use the laws of physics is able to use the laws of physics in clear reactors     [SU2] Assessment of ability analyse information [SU1] Assessment of task fulfilment       Subject contents     lecture: thermodynamic aspects of nuclear power plant exercises: calculation of the analyses of heat transfer and hydraulic resistance on colant flow under single-phase forced convection conditions, heat transfer under coolant boiling con contical heat flux, residual heat, thermal-flow processes under reactor failure conditions exercises: calculation of themprature distribution in core elements, determination of heat transfe	Learning activity and number of study hours	Learning activity	classes includ				Self-study		SUM
Learning outcomes     Course outcome     Subject outcome     Method of verification       Learning outcomes     [K7_K11] is aware of importance of professional acting, the need for critical verification of acquired knowledge and consulting experts opinion in case of facing difficulties with individual problem solving     critically verifies the results of student own work, using reliable sources of information     [SK5] Assessment of ability solve problems that arise in practice       [K7_W01] explains and describes, based on general knowledge in the field of scientific disciplines forming the theoretical foundations of Nuclear Power Technologies, the physics of processes, the physics of processes, the physics of processes, the physics of processes, the physics and devices of a nuclear power plant     defines the principles of conservation of a nuclear power plant     [SU2] Assessment of factual navigue and materials for reactors, systems, machines and devices of a nuclear power sector and related industries     is able to use the laws of physics learned in the analysis of selected thermohydraulic processes in nuclear reactors     [SU2] Assessment of task fulfilment       Subject contents     Iecture: thermodynamic aspects of nuclear power plant operation, coolants and their properties, heat sources in a nuclear reactor, heat conduction in fuel elements, heat transfer and hydraulic resistance oritical heat flux, residual heat, thermal-flow processes under reactor failure conditions exercises: calculation of the prature distribution in core elements, determination of heat transfer coeff in single-phase forced convection ocolant, determination of heat transfer coeff in single-phase forced convection colant, determination of heat transfer coefficient during boili			30	5.0			15.0		50
[K7_K11] is aware of importance of professional acting, the need for critical verification of acquired knowledge and consulting experts opinion in case of facing difficulties with individual problem solving     critically verifies the results of student own work, using reliable sources of information     [SK5] Assessment of ability solve problems that arise in practice       [K7_W01] explains and describes, based on general knowledge in forming the theoretical foundations of Nuclear Power Technologies, the physics of processes, structure, principle of operation, operation, safety aspects, fuels and materials for reactors, systems, machines and devices of a nuclear power plant     defines the pinciples of conservation of mass, momentum, and energy, explains the mechanisms of heat transfer in key components of a nuclear power plant     [SU2] Assessment of ability analyse information       [K7_U01] utilizes acquired analytical, simulation, and experimental methods, as well as mathematical models to analyse and evaluate processes occurring in nuclear power search and related industries     is able to use the laws of physics learned in the analysis of selected hermohydraulic processes in nuclear reactors     [SU2] Assessment of ability analyse information [SU1] Assessment of task fulfilment       Subject contents     fecture: thermodynamic aspects of nuclear power plant operation, coolants and their properties, heat sources in a nuclear reactor, heat conduction in fuel elements, heat transfer and hydraulic resistance coolant flow under single-phase forced convection of conditions, heat transfer coefficient during boling, or ritical heat flux, residual heat, thermal-flow processes under reactor failure conditions exercises: calculation of temperature distribututon in core elements, determination of heat transfer coef	Subject objectives	Education of students	in the field of	thermohydrauli	ic issues of nuc	clear rea	actors.		
of professional acting, the need for critical verification of acquired knowledge and consulting experts opinion in case of facing difficulties with individual problem solving     sources of information     solve problems that arise in practice       [K7_W01] explains and describes, based on general knowledge in the field of scientific disciplines forming the theoretical foundations of Nuclear Power Technologies, the physics of processes, structure, principle of operation, operation, safety aspects, fuels and materials for reactors, systems, machines and devices of a nuclear power plant     defines the principles of conservation of mass, momentum, and energy; explains the mchanisms of heat transfer in key components of a nuclear power plant     [SW1] Assessment of factuat knowledge       [K7_U01] utilizes acquired analytical, simulation, and experimental methods, as well as mathematical models to analyse and evaluate processes corurring in nuclear power plant     is able to use the laws of physics learned in the analysis of selected thermohydraulic processes in nuclear reactors     [SU1] Assessment of ability analyse information [SU1] Assessment of task fulfilment       Subject contents <i>lecture</i> : thermodynamic aspects of nuclear power plant operation, coolants and their properties, heat sources in a nuclear reactor, heat conduction in fuel elements, heat transfer and hydraulic processes and evaluate processes of cred convection in core elements, heat transfer under coolant boiling con critical heat flux, residual heat, thermal-flow processes under reactor failure conditions exercises: calculation of temperature distribution in core elements, determination of heat transfer coefficient during boiling.	Learning outcomes	Course outcome Subject outcome Method of verification							erification
based on general knowledge in the field of scientific disciplines forming the theoretical foundations of Nuclear Power Technologies, the physics of processes, structure, principle of operation, operation, safety aspects, fuels and materials for reactors, systems, machines and devices of a nuclear power plantconservation of mass, momentum, and energy; explains the mechanisms of heat transfer in key components of a nuclear power plantknowledge[K7_U01] utilizes acquired analytical, simulation, and experimental methods, as well as mathematical models to analyse and evaluate processes occurring in nuclear power sector and related industriesis able to use the laws of physics learned in the analysis of selected hermohydraulic processes in nuclear reactors[SU2] Assessment of ability analyse information [SU1] Assessment of task fulfilmentSubject contentslecture: thermodynamic aspects of nuclear power plant operation, coolants and their properties, heat sources in a nuclear reactor, heat conduction in fuel elements, heat transfer and hydraulic resistance of coolant flow under single-phase forced convection of coolant, determination of heat transfer coefficient during boiling, exercises: calculation of temperature distribution in core elements, determination of heat transfer coefficient during boiling, in single-phase forced convection of coolant, determination of heat transfer coefficient during boiling,		of professional acting, the need for critical verification of acquired knowledge and consulting experts opinion in case of facing difficulties with individual problem		student own work, using reliable					
analytical, simulation, and experimental methods, as well as mathematical models to analyse and evaluate processes occurring in nuclear power sector and related industrieslearned in the analysis of selected thermohydraulic processes in nuclear reactorsanalyse information [SU1] Assessment of task fulfilmentSubject contentslearned in the analysis of selected thermohydraulic processes occurring in nuclear power sector and related industrieslearned in the analysis of selected thermohydraulic processes in nuclear reactorsanalyse information [SU1] Assessment of task fulfilmentSubject contentslearned industrieslearned in the analysis of selected thermohydraulic processes in nuclear reactorsanalyse in sources in a nuclear sector, heat conduction in fuel elements, heat transfer and hydraulic resistance of coolant flow under single-phase forced convection conditions, heat transfer under coolant boiling cond critical heat flux, residual heat, thermal-flow processes under reactor failure conditions exercises: calculation of temperature distribution in core elements, determination of heat transfer coefficient during boiling, in single-phase forced convection of coolant, determination of heat transfer coefficient during boiling,		based on general knowledge in the field of scientific disciplines forming the theoretical foundations of Nuclear Power Technologies, the physics of processes, structure, principle of operation, operation, safety aspects, fuels and materials for reactors, systems, machines and devices of		conservation of mass, momentum, and energy; explains the mechanisms of heat transfer in key components of a nuclear			[SW1] Assessment of factual knowledge		
sources in a nuclear reactor, heat conduction in fuel elements, heat transfer and hydraulic resistance of coolant flow under single-phase forced convection conditions, heat transfer under coolant boiling condicient like the second se		analytical, simulation, and experimental methods, as well as mathematical models to analyse and evaluate processes occurring in nuclear power sector and		learned in the analysis of selected thermohydraulic processes in			[SU1] Assessment of task		
	Subject contents	sources in a nuclear reactor, heat conduction in fuel elements, heat transfer and hydraulic resistance during coolant flow under single-phase forced convection conditions, heat transfer under coolant boiling conditions, critical heat flux, residual heat, thermal-flow processes under reactor failure conditions <i>exercises</i> : calculation of temperature distribution in core elements, determination of heat transfer coefficient in single-phase forced convection of coolant, determination of heat transfer coefficient during boiling,							
Prerequisites thermodynamics, fluid mechanics, heat transfer   and co-requisites thermodynamics, fluid mechanics, heat transfer		, ,							

Assessment methods	Subject passing criteria	Passing threshold	Percentage of the final grade		
and criteria	colloquium	56.0%	40.0%		
	written assessment of the lecture	56.0%	60.0%		
Recommended reading	Basic literature   Brennen C.E.: Thermo-hydraulics of nuclear reactors. Cambridge University Press, 2016     Zohuri B.: Thermal-hydraulic analysis of nuclear reactors, Springer, 2017				
	Supplementary literature	Todreas N.E., Kazimi M.S.: Nuclear systems I, Thermal hydraulic fundamentals, Taylor & Francis, 1993			
	eResources addresses				
Example issues/ example questions/ tasks being completed	Methods of determining heat transfer coefficients. Methods of determining pressure losses in an installation. Methods of heat transfer.				
Work placement	Not applicable				

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