Igor Sikorsky Kyiv Polytechnic Institute

UG Fellowship Educational-Training Program for Indian students, Summer-2018.
INSTITUTE OF MECHANICAL ENGINEERING
List of Projects

№	Name of project	Description of project	Name of Professor/ mentor	Name of Applicants	Remarks
1.	Stress strain state of biomechanical systems of lower limbs with fixation systems 1	Stress-strain state study of biomechanical systems using CAD / CAE	Ph.D. Viktor Yeshchenko		Students after the third year of study
2.	Stress strain state of biomechanical systems of lower limbs with fixation systems 2	Stress-strain state study of biomechanical systems using CAD / CAE	Ph.D. Viktor Yeshchenko		Students after the third year of study
3.	Definition stiffness of biomechanical systems 1	Experimental study of biomechanical systems	Ph.D. Viktor Yeshchenko		Students after the third year of study
4.	Definition stiffness of biomechanical systems 2	Experimental study of biomechanical systems	Ph.D. Viktor Yeshchenko		Students after the third year of study
5.	Laser cladding techniques using High Power Diode Lasers	Numerical simulation and Experimental study of laser systems	DSc, Prof. L.Golovko Assistent: - R.Djuk		Students after the third year of study

6.	Peculiarities of coaxial laser cladding	Numerical simulation and Experimental study of laser systems	DSc, Prof. L.Golovko Assistent: - R.Djuk		Students after the third year of study
7.	Parts restoration on-site using laser cladding	Numerical simulation and Experimental study of laser systems	DSc, Prof. L.Golovko Assistent: - R.Djuk		Students after the third year of study
8.	Mobile platforms for laser cladding technological properties	Numerical simulation and Experimental study of laser systems	DSc, Prof. L.Golovko Assistent: - R.Djuk		Students after the third year of study
9.	DEVELOPMENT OF AUTOMATIC SYSTEM OF HYDROFICATED DRILLING MACHINE	Hydraulic circuit and PLC control programs of hydroficated drilling machine must be developed.	Ass.Prof., PhD O.Levchenko		Students after the third year of study
10.	DEVELOPMENT OF AUTOMATIC SYSTEM OF PNEUMATIC PRESS	Pneumatic circuit and PLC control programs of pneumatic press must be developed.	Ass.Prof., PhD O.Levchenko o		Students after the third year of study
11.	Development of technological process for CNC machine	Students develop a technological process. What includes the choice of instrument, tooling, calculating cutting modes and writing a control program for CNC machine. And also the implementation of the developed project on CNC machines HAAS	DSc, Prof. Y.Petrakov Assistant D. Shupletsov		Students after the third year of study

12.	FeatureCAM –PowerMill	Dynamic machine control, Improved stock simulation, Enhanced turning abilities	Ass. Prof., PhD J. Bessarabets		Students after the third year of study
13.	Structural Analysis of Aircraft Components	CAD/CAM/CAE Informational techniques for aviation and engineering structures in the engineering analysis systems	Ass. Prof., PhD, M. Gladskyi,		Students after the third year of study
14.	Process Planning Using Methodologies of Value Analysis for Aircraft Structures	CAD/CAM/CAE Informational techniques for aviation and engineering structures in the engineering analysis systems	Ass. Prof., PhD, M. Gladskyi,		Students after the third year of study

Prof., DSc, Oleksandr V. Shevchenko
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Igor Sikorsky Kyiv Polytechnic Institute

UG Fellowship Educational-Training Program for Indian students, Summer-2018.
FACULTY OF HEAT POWER ENGINEERING
Nano satellite department
List of Projects

№	Name of project	Description of project	Name of Professor/mentor	Name of Applicants	Remarks
1.	Satellite communication control center and mission control center	1.Analysis: • Ground station requirements; • Place and conditions; • Communications Schema development; • Approve concept. 2.Frequency allocation and licensing: • Ground Control station licensing; • IARU frequency allocation application; • ITU notification application; • Build ground segment infrastructure for satellite communication; • Develop and test onboard and ground telecommunication software, implement telecommunication protocols. 3.Testing. 4.Trainings. 5.Mission Operations.	PhD Rassamakin Boris		
2.	Designing the subsystem of thermoregulation	1. The main factors affecting the thermal regime of the satellite. Choice of the type of the thermal control subsystem. 2. Stages of designing of a subsystem of thermoregulation. 3. Mathematical model of the thermal regime of the satellite: 3.1. Geometric model and external heat fluxes. 4. Thermovacuum tests of the satellite.	PhD Rassamakin Boris		
3.	Modeling of the thermal regime of a nanosatellite in the solar-synchronous orbit of the Earth	The project includes: thermal analysis of the design of a nanosatellite (NC) with the use of cellular panel heat shields, and thermo-regulation coatings in order to passively provide optimal thermal mode of operation of satellite equipment. Each component of a nanosatellite works in accordance with its permissible range of temperatures, therefore, it is advisable to carry out a numerical and experimental study nanosatellite in the conditions of outer space. The numerical simulator is ESATAN-TMS software package, based on the lumped parameter method. The	PhD Rassamakin Boris		

		models of the thermal state of the nanosatellite using ESATAN / ESARAD packages should be developed. In order to confirm the results, to investigate and identify possible problems, awakens the research of the main elements of the design, such as batteries, electronic equipment and a solar cell frame. The total thermal analysis in the ESATAN-TMS software package is expected to be presented in two stages: radiation analysis and thermal analysis. The model is represented as a network of isothermal nodes connected by thermal bonds (radiant and conductive). Buds calculated external heat fluxes in orbit of the Earth, design and internal sources of heat on electronic boards were used as the source data for the thermal model of the NC. As a result of calculations, the nonstationary satellite model and the first idea of the maximum and minimum values of the NC temperatures in the Earth's orbit are given.			
4.	On Board Computer: Modes of satellite operation	1. Pre-starting or starting (Launch mode). 2. Initial flight mode (Post-launch mode). 3. Basic orbital modes (Orbital modes): 3.1. Beacon mode; 3.2. Recharge mode; 3.3. Session mode (Telecom mode); 3.4. Failover mode (Failsafe mode); 3.5. Off mode of the satellite; 3.6. The mode of faulty batteries (Sun mode).	PhD Rassamakin Boris		
5.	The design, development and laboratory tests of the 2-axis sensor Sun	Sun sensors represent a common and reliable technology for attitude determination, employed in many space missions thanks to their limited size and weight. Typically, two-axis digital Sun sensors employ an array of active pixels arranged behind a small aperture; the position of the sunlight's spot allows to determine the direction of the Sun. With the advent of smaller vehicles such as CubeSats and Nanosats, there is the need to further reduce the size and weight of such devices: as a trade-off, this usually results in the curtail of the performances. Nowadays, state of the art Sun sensors for CubeSats have resolutions of about 0.5°…10, with fields of view in the 45° to 90° range, with off-the-self prices of several thousands of dollars. In this work we introduce a novel low-cost miniaturized Sun sensor, its main feature is the reduced size with respect to state-of-the-art sensors developed from the same technology, making it employable on CubeSats. The design, development and laboratory tests of the sensor are here introduced, starting with the definition of the physical model, the geometrical layout and its theoretical resolution; a more accurate model	PhD Rassamakin Boris		

		was then developed in order to account for the geometrical deviations and deformations of the pinhole-projected light-spot, as well as to account for the background noise and disturbances to the electronics. The laboratory setup is presented along with the test campaigns: the results obtained are compared with the simulations, allowing for the validation of the theoretical model.			
6.	Development of the program and conducting of thermo-vacuum tests of the nanosatellite model at the experimental stand	The program and methodology determine the scope and procedure for testing the engineering model of the student nanosatellite PolyITAN-1 in the context of complex impacts of space factors. The conditions of outer space are provided by the thermocouple chamber TCE-0.12 with cooled liquid nitrogen shields. The object of the tests is the engineering model of the Polytean-1 University nanotechnology student PolyITAN-1. Nanosatellite is a small spacecraft (artificial Earth satellite), having a weight of about 1 kg and dimensions of 100x100x113 mm. Nanosatellite consists of subsystems: data processing, orientation and stabilization, navigation, telemetry, power supply, transceiver subsystem, interconnection cable network and construction (trusses and installation plates). The design of the NS provides a mechanical connection of the on-board equipment and all the elements of the satellite into a single whole, the installation of the cable network, zachekovku, their fixation at the time of transportation, putting into orbit and bringing into working order in orbit. The purpose of the tests is to test the performance of the main systems of the model of the university student's PolyITAN-1 Polytechnic at simulating the conditions of its functioning in the Earth's orbit. The main task is to test the performance of the basic devices and systems of the model of the university student's PolyITAN-1 under the influence of "cold black" space, solar radiation and sunlight reflected by the Earth (ie thermovacuum factors). Also, the comparison of thermal conditions with the design parameters of the main working systems of the National Assembly when it is undocked from the carrier rocket, as well as in the regime of normal flight in orbit, (ie, when the satellite stabilized). Validation of workability is subject to: the central processor; payload; radio communication systems; power supply systems. The results of thermovacuum tests of the engineering model of the National Assembly are reflected in the Test Report. The protocol should describe the experimental setup, the locations of the thermocouple installation, the results of the testing of the engineering model of the National Assembly, their analysis and recommendations	PhD Rassamakin Boris		

		for the design of the experimental flight model of the National Assembly with an effective passive thermal control system.			
7.	Designing a solar cell on a pane panel for a nanosatellite of the CubeSat format	The documentation for the solar cell frame should be developed. Tasks for designing the project-develop documentation for the solar cell frame (SB) and to make the SB. Development of a technical task for the manufacture of WB with thermoregulating cellular frames. Carried out the simulation of the thermal modes of the elements of the systems of the nanosatellite (NS) systems in the conditions of orbital flight around the Earth. 3D model of frame and solar battery to PolyItan nanosatellite has been developed. It is planned to carry out the following tests of the frame and electrical supply system: tests of batteries and solar panels and tests of the measuring part of the electrical supply system. The thermal state of the power supply system and the SB is in the process of numerical simulation in the ESATAN-TMS software package, based on the lumped parameter method. To calculate the SB, a special module will be written. The results of the calculation of external heat fluxes, heat exchange in the SB and the temperature field are calculated in the ESATAN-TMS package. Before creating a detailed model, it is believed that the main elements of the solar cell frame are being studied. The general thermal analysis in the ESATAN-TMS software package is expected to be presented as a network of isothermal nodes connected by thermal bonds (radiant and conductive). An analysis of the results of simulation and testing of the electrical supply system with the SB will show that it is ready for use in the conditions of outer space.	PhD Rassamakin Boris		
8.	Strength of nanosatellite POLYITAN-2 in action of random loads at stage of transfer to orbit	Within the framework of existing standards for the creation of new spacecraft, the design and development of both large and ultra-small satellites requires the solution of a wide range of problems associated with analyzing the strength of satellites at different stages of their life cycle. The main and most difficult, from the point of view of ultimate loads, is the stage of putting into orbit. At this stage, the satellite is subject to extreme accelerations, harmonic and random vibrations, shock loads. In this paper we present the strength analysis of the nanosatellite POLYITAN-2 under the action of random vibrations at the stage of launching into orbit. An effective solid-state model and a corresponding finite element model of a nanosatellite have been developed. With the use of the software complex Ansys, a computational study of the stress-strain state of the nanosatellite was carried out. The strength of the structural elements is evaluated. It is established that for the considered	PhD Rassamakin Boris		

		version of POLYITAN-2 the strength conditions are fulfilled.			
9.	Two-stage distiller	The purpose of the work is to develop a scheme and a laboratory model of a two-stage distiller, which can operate in the mode of double distillation for medicine, experimental testing of its characteristics.	Ph.D., Associate Professor Barabash Petro		
10.	Vacuum distillation unit with jet heat transformer	The main goal of the work is to develop a scheme of a film distillation unit with heat steam-transformer for sewage treatment and desalination of seawater.	Ph.D., Associate Professor Solomakha Andriy		

General Prerequisite knowledge required

Students after the 2nd–3rd year of study; Basics of technical thermodynamics; Basics of heat and mass transfer; Basics of mechanics of liquids and gases; Basics of technical measurements.

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UG Fellowship Educational-Training Program for Indian students, Summer-2018.
FACULTY OF HEAT POWER ENGINEERING
List of Projects

№	Name of project	Description of project	Name of Professor/mentor	Name of Applicants	Remarks
1.	Heat transfer intensity in heating and condensation zones of miniature heat pipes	Developing and investigating of miniature cooling systems is an actual task due to miniaturization of electronic equipment. Miniature heat pipes (MHP) can be used as main components of such systems. MHPs are heat pipes with number $Bo<2$. Effectiveness of MHP working is defined by heat transfer intensity in evaporation and condensation zones. That's why this topic requires a detailed investigation.	Dr.Sci., Senior Researcher Kravets Volodymyr		
2.	Influence of geometrical factors on heat transfer characteristics of miniature heat pipes	Developing and investigating of miniature cooling systems is an actual task due to miniaturization of electronic equipment. Miniature heat pipes (MHP) can be used as main components of such systems. MHPs are heat pipes with number $Bo<2$. Geometrical parameters make great influence on heat transfer processes inside MHP, which, in its turn, defines effectiveness of working of this device. That's why investigation of influence of these factors on MHP characteristics is actual.	Dr.Sci., Senior Researcher Kravets Volodymyr		
3.	Gravity influence on maximum heat transfer ability of miniature heat pipes	Developing and investigating of miniature cooling systems is an actual task due to miniaturization of electronic equipment. Miniature heat pipes (MHP) can be used as main components of such systems. MHPs are heat pipes with number $Bo<2$. In spite the fact, that presence of wick makes possible working of MHP at any orientation in space, orientation influences on MHP heat transfer characteristics and this topic requires an investigation.	Dr.Sci., Senior Researcher Kravets Volodymyr		
4.	Gravity influence on maximum heat transfer ability of thermosyphons	A thermosyphon is a two-phase heat transfer device made in a form of hermetical evacuated tube partially filled with heat carrier. When heat is inputted to a thermosyphon heat carrier begins to evaporate and boil. Generated vapor flows to a condensation zone under acting of pressure difference. In this zone it condensates and liquid flow down to an evaporation zone under acting of gravity force (at vertical orientation with bottom heating). Further cycle repeats. Thus, gravitational force makes a great influence on heat transfer characteristics of thermosyphons and this influence need to be investigated.	Dr.Sci., Senior Researcher Kravets Volodymyr		

5.	Influence of heating and condensation zones lengths on heat transfer characteristics of pulsating heat pipes.	Pulsating heat pipes (PHP) are one of the newest types of heat pipes. Their advantage is absence of wick which simplifies their manufacturing process and reduces their cost. But characteristics of PHPs not worse that these of conventional heat pipes, and they have an ability of working at any orientation in space. Lengths of an evaporation and condensation zones make a great influence on PHP heat transfer characteristics. But data about influence of ratio between lengths of these zones on the characteristics is almost absent in literature. That's why this topic requires an investigation.	Ph.D. Alekseik Yevhenii		
6.	Heat transfer characteristics of pulsating heat pipes with inner diameter of 3 mm	Pulsating heat pipes (PHP) are one of the newest types of heat pipes. Their advantage is absence of wick which simplifies their manufacturing process and reduces their cost. But characteristics of PHPs not worse that these of conventional heat pipes, and they have an ability of working at any orientation in space. Capillary forces should act on heat carrier to allow PHP functioning in pulsating mode. Value of these forces depends not only from heat carrier properties but also from PHP inner diameter. That's why most of researchers investigate PHP with inner diameter 2 mm and less. But according to literature data, increasing of the inner diameter leads to increasing of heat transfer characteristics of PHP, that's why studying of PHP with big inner diameter (more than 2 mm) is expediently.	Ph.D. Alekseik Yevhenii		
7.	Investigation of heat transfer intensity at boiling in aluminum grooved heat pipes	Aluminum grooved heat pipes (AGHP) are perspective heat transfer devices for using in many branches of technique and industry due to simplicity of manufacturing and high heat transfer characteristics. Investigation of influence of length and position of an evaporation zone on intensity and peculiarities of heat transfer process at boiling in AGHP will be provided in this work. Position of an evaporation zone will be next: bottom, top, bottom and top at the same time.	Dr.Sci. Khairnasov Sergii		
8.	Investigation of heat transfer intensity at condensation in aluminum grooved heat pipes	Aluminum grooved heat pipes (AGHP) are perspective heat transfer devices for using in many branches of technique and industry due to simplicity of manufacturing and high heat transfer characteristics. Investigation of influence of length and position of a condensation zone on intensity and peculiarities of heat transfer process at boiling in AGHP will be provided in this work. Position of a condensation zone will be next: bottom, top, bottom and top at the same time.	Dr.Sci. Khairnasov Sergii		
9.	Investigation of boundary density of heat flux at boiling in aluminum	Aluminum grooved heat pipes (AGHP) are perspective heat transfer devices for using in many branches of technique and industry due to simplicity of manufacturing and high heat transfer characteristics. The main task of the work is obtaining of patterns of influence of	Dr.Sci. Khairnasov Sergii		

	grooved heat pipes	AGHP geometrical parameters and heat carrier filling ratio on value of boundary density of heat flux.			
10.	Experimental study of heat transfer and aerodynamic of drop-shaped tube	The work is aimed at studying the dependence of the intensity of the convective heat transfer of drop-shaped tubes and their aerodynamic resistance to the flow velocity in the case of a transverse flow of air. Heat transfer is studied on the basis of experimental measurements of the temperature field of the tube. The determination of the aerodynamic resistance is due to the measurement of the difference in static pressure before and after the drop-shaped tube. Experiments are carried out on an aerodynamic stand, which is an open type aerodynamic tube.	M.Sci. Semenyako Olexandr		
11.	Experimental study of heat transfer for plain-oval finned tubes in natural draft conditions	The work is aimed at studying the dependence of the intensity of the convective heat transfer of finned plain-oval tubes in natural draft conditions depending on the heat dissipation capacity. Heat transfer is studied on the basis of experimental measurements of the temperature field of the tubes. Experiments are carried out on an special aerodynamic stand.	Ph.D., Senior Researcher Terekh Olexandr		
12.	Experimental study of heat transfer and aerodynamic drag for staggered bundle of smooth tubes in transversal air flow	The work is aimed at studying the dependence of the intensity of the convective heat transfer of staggered bundle of smooth tubes and their aerodynamic resistance to the flow velocity in the case of a transverse flow of air. Heat transfer is studied on the basis of experimental measurements of unstable temperature field of the tube-calorimeter using the regular method. The determination of the aerodynamic resistance is due to the measurement of the difference in static pressure before and after the bundle. Experiments are carried out on an aerodynamic stand, which is an open type aerodynamic tube.	M.Sci. Semenyako Olexandr		
13.	Experimental study of local heat transfer coefficients on fins top side of flat-oval tubes	The work is aimed at distribution of heat transfer coefficients on fins top side of flat-oval tubes to the flow velocity in the case of a transverse flow of air. Heat transfer is studied on the basis of direct experimental measurements of heat fluxes on the surface of the fins and its temperature fields. Experiments are carried out on an aerodynamic stand, which is an open type aerodynamic tube.	M.Sci. Semenyako Olexandr		
14.	Experimental study of hydrodynamic characteristics of flow in the channel by thermal anemometry	The work is aimed at definition of velocity fields and their pulsations with air flow in a rectangular channel. Experiments are carried out using a hot-wire thermoanemometer of constant temperature on an aerodynamic stand, which is an open type aerodynamic tube.	M.Sci. Semenyako Olexandr		

	methods				
15.	Experimental study of heat transfer and aerodynamic drag for staggered bundle of screw groves tubes in transversal air flow	The work is aimed at studying the dependence of the intensity of the convective heat transfer of staggered bundle of screw groves tubes and their aerodynamic resistance to the flow velocity in the case of a transverse flow of air. Heat transfer is studied on the basis of experimental measurements of the temperature field of the tubes. The determination of the aerodynamic resistance is due to the measurement of the difference in static pressure before and after the drop-shaped tube. Experiments are carried out on an aerodynamic stand, which is an open type aerodynamic tube.	M.Sci. Reva Sergiy		
16.	Evaluation of the individual service life-time of turbine equipment	The casings and rotors of steam turbines are the most expensive high-temperature elements of thermal and nuclear power plants. After the exhaustion of the project service time of this equipment, it is customary to replace it with a new one. However, it is possible to extend the term of exploitation after performing work to determine the current state of the equipment. The estimation of the individual resource allows to predict the state of the base metal, based on modern methods of mathematical modeling, which include the determination of the thermal and stress-strain state of the metal, its long-term strength and resistance to low-cycle fatigue.	Dr.Sci., Professor Chernousenko Olga		
17.	Evaluation of the individual service life-time of steam pipelines, locking and control valves	Steam lines, stop valves and control valves are under the influence of the highest temperatures among other elements of steam turbine installation of thermal and nuclear power plants. The applied methods of computational fluid dynamics make it possible to study the conditions and nature of the vapor outflow in these elements under different conditions of regillation. Also of great interest is the character and uneven distribution of temperatures in the thick-walled elements of the turbine valves, which has a high degree of influence on the service life-time of the base metal.	Dr.Sci., Professor Chernousenko Olga		
18.	Evaluation of the individual service life-time of boiler equipment	The issues of taking account of damage caused by exposure to high levels of local temperatures of gases, local non-uniformity of temperature and reliable assessment of residual resource of hightemperature elements are relevant and will provide for a reliable and long-term operation of energy generating equipment. A mathematical model is developed for the combustion process in burner devices with stabilizers based on the software complex ANSYS Fluent. It was created a technique for determining the impact of levels of temperatures and their gradients on the assessment of residual resource of high-temperature elements of power and industrial equipment. Based on data on the work of industrial power equipment and results of	Dr.Sci., Professor Chernousenko Olga, Ph.D., Associate Professor Butovsky Leonid		

		physical experiments, we selected correct initial and boundary conditions that enabled adequate simulation of the influence of non-uniformity in the combustion products temperature field. Based on the software complex Solid Works, we performed calculation studies that take into account the gas-dynamics of gas flow that flows around the pipeline. The thermal and stress-strained states are defined and an estimation is conducted of operational lifecycle of pipeline in a boiler plant depending on the operating conditions of equipment.			
19.	Operation time extension for TPP and NPP power equipment	Provision of reliable and long-term operation of steam turbine equipment of the thermal power plant requires determining individual service life of its high-temperature elements. Estimated service time is, to great extent, limited to various technological, constructive or mode factors that were not foreseen or sufficiently studied at the design stage. Accelerated finishing of residual service life of operating equipment under current economic condition is not permissible because the current operation time of the majority of turbine equipment already exceed the fleet one. Identification of dominating factors and mechanisms of aging, reduction or limitation of their impact on the rate of exhausting of assigned service life of high-temperature elements of steam turbines is a relevant problem both in scientific and practical terms.	Dr.Sci., Professor Chernousenko Olga		
20.	Biomass-firing mini CHPP	Designing a mini cogeneration heat power plant operating on biofuel. The main fuel is the recycled waste of the wood and cardboard industry. It is planned to develop training laboratories on the basis of CHPP for students of the Igor Sikorsky Kyiv Polytechnic Institute.	Dr.Sci., Professor Chernousenko Olga		
21.	A mobile power complex that operates on different types of fuel	The mobile cogeneration power complex will work on different types of fuels, including renewable: wood, leaves, waste wood and agricultural production, solid household waste, etc. The installation will provide highly efficient power generation up to 500 kW with an efficiency of no less than 40%, as well as thermal energy with a total efficiency of not less than 96%. The power installation is intended for special purpose needs, namely energy supply of hospitals located in the field, regions where natural or man-made disasters have occurred and where stationary power supply is damaged, etc. Implementation of such facilities will allow increasing energy efficiency of renewable energy sources in distributed generation systems by highly efficient power generation, reducing the cost of transporting low calorific fuels,	Dr.Sci., Professor Chernousenko Olga, Ph.D., Associate Professor Butovsky Leonid		

		and the cost of electricity transmission in networks.			
22.	Technology of micro flare gas combustion in stabilization type burners with advanced capabilities of control of the temperature level and temperature profile of combustion products for firing devices for energy and industrial usage	The main approaches in developing the technology of micro flare gas combustion are: the scheme of organizing the mixture of fuel and oxidant provides the optimal ratio of combustion components; micro flares highly efficient combustion of fuels is realized in the system of stabilizers of a relatively small size; reliable stabilization of the combustion process is ensured by the presence of zones of recirculation of stabilizers. An important feature of the developed technology is the modularity of the design. It is possible to develop burners of different capacities due to the change in the number of stabilizers, each of which can be considered as a separate burner. There is a possibility to influence on the combustion process and the length of the torch by the individual stabilizers and thus form the length of the flame, the distribution of heat fluxes and the necessary profile of the temperature of gases in the furnace space.	Ph.D., Associate Professor Butovsky Leonid		
23.	Optimization of the mode of operation of the heating and hot water supply system of the building using solar collectors and photovoltaics	Course work is devoted to determining the optimal mode of operation of heating and hot water supply systems at home using solar collectors and solar panels for electricity generation. A building is located in a high-hiker area of the country with fluctuations in the temperature of the air from -8 ° C in winter to + 20 ° C in the summer. Such climatic conditions are required for providing comfortable living conditions and living in a building with a heating and hot water supply system. The student-bachelor, based on the initial data, calculates the main values of the heating of the building, determines the required number of solar collectors and photovoltaic solar panels, creates the corresponding technological scheme of communication of these systems and optimizes the operating modes of these systems.	Dr.Sci., Professor Varlamov Gennadii		
24.	Development of heat supply system (heating and hot water supply) at home using hydrogen contact heat generator	Course work is devoted to the development of heating and hot water supply at home using hydrogen contact heat generator, which works on hydrogen produced by the solar power supply system based on photovoltaic. A dwelling house is located in a high-hiker area of the country with fluctuations in the temperature of the air from -8 ° C in winter to + 20 ° C in the summer. Such climatic conditions are required for providing comfortable living conditions and living in a house with a heating and hot water supply system. Based on the initial data, a student-bachelor carries out the calculation of the main values of the heat supply system of the building, determines the number of photovoltaic solar panels, selects the	Dr.Sci., Professor Varlamov Gennadii		

		necessary equipment of the system of power consumption, determines the main characteristics of the contact heat generator operating on hydrogen fuel, creates a technological scheme of production and consumption of hydrogen, optimizes operating modes all components of the system.			
25.	The heat pump system for maintenance of the set parameters of air in the production room with heat and moisture extraction in the conditions of hot climate	The usual heat pump system for air conditioning in a warm or hot period of the year involves maintaining the room in the given temperature conditions. In production premises with heat and moisture separation there is a need to maintain not only the temperature but humidity. With a significant moisture content of external air exceeding the prescribed moisture content of air in the room, maintenance of the necessary thermo-humidity regime cannot be solved by the usual ventilation of the room and requires the use of special equipment not only for cooling, but also drainage of the inflow air. To solve such problems a specially developed heat pump scheme with cooling and drainage of the inflow air can be used. The course project will propose the appropriate heat pump scheme for calculating the parameters of such a heat pump scheme, numerical calculations and their analysis to determine the conditions for efficient use of heat pump system to provide a given heat-air mode of air in the production premises.	Dr.Sci., Professor Bezrodny Mikhailo		
26.	Using of CAD-systems for design and numerical simulation of processes in heat-mass exchange energy equipment	Heat exchangers are widespread in modern technology and have a very difference application. At the same time, a many requirements for modern heat exchangers (high efficiency, simplicity of construction, cheap materials and manufacturing, compactness and low weight of the device, etc.) should be taken into account at the stage of their design. Expansion of the field of application of computer-aided design systems (CAD-systems) allows to simplify the process of designing heat exchangers, improves accuracy, reduces the design time, allows to automate the drawing of constructed product and its parts, to make a quick engineering analysis of the created design (analysis of strength, heat-, air- , hydrodynamic calculations). In the coursework, it is proposed to make design calculation of the shell and tube heat exchanger "air-water", which is the cooler of the compressor equipment. As a result of the design, it is necessary to determine the thermal, hydrodynamic and structural characteristics of the apparatus, and to construct a three-dimensional model of the heat exchanger and obtain design drawings by the system of automated design (SolidWorks). The SolidWorks software is currently a modern comprehensive	Ph.D., Associate Professor Kutra Dmitro		

		software package that allows you to create and comprehensively analyze equipment and its components (including heat power energy equipment), study and development of which is an integral part of the process of preparing a modern engineer and designer.			
27.	Increasing the efficiency of the enterprise through the use of resource-efficient and clean production	An important step towards sustainable development is the formation of modern ecological and economic thinking and arming with the latest world-wide approaches and principles for making the necessary decisions for the effective development of enterprises and increasing their competitiveness. The resource efficient and cleaner production method developed jointly by UNIDO and UNEP aims at preventing the negative impact on the environment, increasing the efficiency of industrial production and reducing risks to humans and the environment. The course project includes an assessment of six key aspects of production: the choice and effective use of materials, efficient energy consumption, sources of supply and efficient water use, reduction of waste generation and their safe disposal, monitoring of emissions into the atmosphere, reduction and treatment of wastewater. The purpose of the course work is to conduct an analysis of the effectiveness of the company to further identify possible losses of energy resources, natural materials and save money resources. Resource efficient and cleaner production is an effective tool for sustainable consumption and production and a way to reduce the negative impact on the environment of industrial enterprises and contributes to the transition to the green economy model in the world.	Assistant of Professor Romanova Katerina		
28.	Binary refrigeration unit with jet compressor	The main goal of the work is to develop a scheme of a binary refrigeration cycle in which the compressor is used as a water jet compressor, while the refrigeration agent is freon that is not soluble in water; experimentally test the efficiency of the developed scheme on a laboratory model.	Ph.D., Associate Professor Solomakha Andriy		
29.	Experimental setup for heat transfer research using the method of a thick wall	The main goal of the work is to develop a scheme of an experimental setup for studying the convective heat transfer coefficient in the pipe (including processes with phase transformations) using «the thick wall method».	Ph.D., Associate Professor Barabash Petro		

Students after the 2nd–3rd year of study; Basics of technical thermodynamics; Basics of heat and mass transfer; Basics of mechanics of liquids and gases; Basics of technical measurements.

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Igor Sikorsky Kyiv Polytechnic Institute

UG Fellowship Educational-Training Program for Indian students, Summer-2018.
FACULTY OF ELECTRICAL POWER ENGINEERING AND AUTOMATICS
List of Projects

№	Name of project	Description of project	Name of Professor/ mentor	Name of Applicants	Remarks
1.	**Part 1. Calculation and modeling of solar power plant in parallel operation on a distribution grid**	1. Calculation of a solar power plant connected to a distribution electrical grid. 2. Simulation of a solar power plant in a distribution electrical grid in the Power Factory program. 3. Investigation of the solar power plant influence on the operating modes of the distribution electrical grid. 4. Analyze the results.	Anna Trunina		Duration is 1 week
2.	**Part 2. Practical methods of short circuits calculation, modeling and relay protection tuning**	1) Analytical calculation of short circuit currents (1,2,3-phase) (2 days) 2) Modelling of short circuits using PowerFactory software (1 day) 3) ABB relay protection calculation, tuning, and modeling (2 days)	Artem Nesterko		Duration is 1 week
3.	**Part 3. Diagnostics of PV modules at field conditions**	1) Mathematical and computer models of photovoltaic modules operation at various external conditions (irradiance, temperature, partial shading) 2) Electrical losses in PV modules and its influence on power of PV plants Measurements and monitoring of electrical parameters and	Aleksandr Gaevsky		Duration is 1 week Necessary knowledge of students: differential and integral calculus, DC electric circuits, semiconductor physics concepts, selected optimization methods, programming in MATLAB

		determination of the efficiency and current state of PV modules			
4.	**Part 4. Logical circuits synthesis, Field Programmable Gate Array (FPGA) and logic relay programming**	1) Assembly of logical schemes based on integrated circuits and breadboards. 2) Work with logical functions in software for programming FPGA Quartus 2. FPGA programming. 3) Basics of Relay Logic LD Language for PLC Programming. Implementing a control scheme based on the Lovato PLC.	Serhii Buryan		Duration is 1 week
5.	**Part 5. Programmable Logic Controllers. Overview, programming and testing.**	1) Structured logic design. 2) Introduction to PLC programming by software "Easy-soft". 3) Developing, debugging and experimental testing of developed automation system.	Serhii Buryan		Duration is 1 week
6.	**Part 6. Variable speed drives for industrial applications**	1) Calculation and simulation of cascade speed and torque control systems of DC electrical drives. 2) Calculation and simulation of frequency control systems of AC electrical drives with induction motors. 3) ABB DC and AC industrial drives (manual and autotuning, modeling, installation, features)	Mykola Pushkar		Duration is 1 week Necessary knowledge of students: - Simulation in Matlab - Fundamentals of induction motors - Fundamentals of DC motors - Fundamentals of control theory

General remarks

Some explanations for traineeship at the FEA:

1. The FEA plans to implement 6 Projects (parts) as a comprehensive work for all students who will come an internship.

2. Despite the fact that classes will be held for the whole group, each student receives his task and his initial data for the course work in the framework of the topic specified in the table.

3. Complex work consists of six parts (from Part 1 to Part 6)

4. The first two parts will be implemented by the Department of Automation of Power Systems;

the second part - the Department of Renewable Electric Power;

the last three - the Department of electric drive.
so students can familiarize themselves with 3 departments and their capabilities.

Igor Sikorsky KPI   **VISHWANIKETAN**
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