BACHELOR THESIS
Due: 31st of January 2023

1	Dr inż. A. Dziembowski Room 139	Point cloud filtering for virtual view synthesis quality improvement. (Filtracja chmury punktów w celu poprawy jakości syntezy widoków wirtualnych).	The goal of the research is to create the method of point cloud filtration. The point cloud will be created using set of views with corresponding depth maps. The method will correct the depth of pixels (e.g. pixels near objects' edges), thus the quality of synthesized virtual views.	1
2	Dr inż. P. Górniak Room 105	Sensitivity analysis of chosen designs of planar mobile antennas on uncertainties of a production process. (Analizawrażliwościwybranychprojektówplanarnychantenmobilnychnaniedokładnościprocesuprodukcyjnego).	Project and experimental work. In the first step, it is necessary to design several antennas in the PCB technology for the frequency band given by the supervisor using the program for numerical analysis of electromagnetic fields. In the second step of the work, numerical experiments should be carried out using the Monte Carlo method in order to analyze the sensitivity of the developed antenna designs to the uncertainties of the production process in relation to the resonant frequency.	1
3	Dr inż. P. Górniak Room 105	Design and realization of a planar filter for DVB-T frequency band. (Projekt i realizacja filtru w technologii planarnej na pasmo DVB-T).	Project and experimental work. In the first step, full-wave solver should be used to design a PCB filter for a DVB-T frequency band. In the second step of the work, the filter prototype should be made. Finally the measurements of the filter prototype should be performed and compared with the results of project calculations.	1
4	Dr inż. T. Grajek Room 137	Demo of selected video processing methods as an interactive webservice.	Analisys of tools related to audio processing in JavaScript and WebGL/WebAudio. Implemantation of selected lessons as interactive wab pages using JavaScript and WebGL/WebAudio. Testing of prepared lessons running on server.	1
5	Dr inż. D. Karwowski Room 118	Analyzer of selected compression modes in the VVC video encoder. (Analizator informacji o wybranych trybach kompresji w koderze wizyjnym VVC).	Development of the analyzer of selected compression modes and preparation of the program implementation. Development and preparation of display module for the results.	1
6	Dr inż. M. Kasznia Room 122	Real-time assessment of Allan deviation and time deviation for moving observation range. (Wyznaczanie dewiacji Allana i dewiacji czasu sygnałów synchronizacji w czasie rzeczywistym dla ruchomego zakresu obserwacji).	Project thesis, programming skills required. Thesis goal: implementation of the algorithms cooperating with measuring unit and enabling the assessment of Allan deviation and time deviation in the real time for moving observation range.	1
7	Dr inż. K. Klimaszewski Room 108	Algorithm for alternative representation of video sequence. (Algorytm do zmiany reprezentacji obrazu ruchomego.)	The idea for this work is to present a sequence of images in a cartoon form – using only lines forming geometric figures filled with an appropriate color.	1

8	Dr inż. S. Maćkowiak Room 103	Generating a building visualization based on a sketch using the GAN network. (Generowanie wizualizacji budynku na podstawie szkicu z wykorzystaniem sieci GAN).	The work aims to implement a system of Generative Adversarial Networks (GAN), which, based on the input sketch, generates an image representing the building. The system should be able to change the style by using another set of learners. The work requires programming skills. Possibility to use OpenCV image processing libraries, TensorFlow, Keres, cuDNN, Torch package.	1-2
9	Dr inż. S. Maćkowiak Room 103	Convolutional Neural Networks Application in Plastic Waste Recognition and Sorting. (Zastosowanie splotowych sieci neuronowych w rozpoznawaniu i sortowaniu odpadów z tworzyw sztucznych)	The work aims will be to develop a solution based on convolution neural networks for the detection of returnable plastic packaging. The work requires programming skills. Possibility to use OpenCV image processing libraries, TensorFlow, Keres, cuDNN, Torch package.	1-2
10	Dr inż. Ł. Matuszewski Room 124	Optical synchronization signal receiver with converter and electric signal distributor (10MHz).	Design and implementation of a synchronization signal distributor. The students' goal is to build a 10MHz signal distributor synchronized to the signal from the optical video converter.	1
11	Dr inż. S. Michalak Room 130	Microprocessor based Line-Follower robot controller.	Design and run the Line-Follower robot controller using the 8-bit AVR microcontroller.	1
12	Dr inż. S. Michalak Room 130	Program illustrating the operation of the von Neuman machine.	Write assembler sample programs illustrating the work of von Neuman architecture.	1
13	Dr inż. D. Mieloch Room 139	The influence of noise on the temporal consistency of segmentation. (Wpływ zaszumienia na czasową spójność segmentacji sekwencji wizyjnych).	The goal of the proposed topic is to study the influence of noise which is present in videos on the temporal consistency of segmentation of these videos. The use of existing segmentation and noise estimation methods is assumed, the knowledge of the C++ is required.	1
14	Dr inż. J. Nikonowicz Room 124	Detection of unknown signals using goodness-of-fit testing.	Comparative analysis of detection techniques dedicated for unknown signals. Research based on a review of available solutions, focused on detection efficiency of techniques based on normality testing. Simulation project.	1
15	Dr inż. J. Nikonowicz Room 124	Detection of unknown signals in intermittent transmission.	Comparative analysis of techniques for detecting unknown signals under conditions of discontinuous transmission. Simulation project based on a review and performance evaluation of available solutions.	1
16	Dr inż. O. Stankiewicz Room 117	Electronic oscilloscope on Arduino.	The goal of the work is to develop a microcontroller-based module and a software allowing for reading of analog signals. Required functionality: 2-4 channels, trigger input, AC/DC coupling, mathematical functions, trigger functions. Output/display interface: UART (FTDI) or LCD display. Langauge: C++, Arduino	1
17	Dr inż. P. Stępczak Room 023	Medium optical converter of short range. (Optyczne konwertery medium krótkiego zasięgu.)	Assessment of audio and video signal requirements in analog and digital transmission. Development of fiber optic transmission links design based on audio	1

			video media converters for multifunctional communication with high reliability and interference resistance.	
18	Dr inż. P. Stępczak Room 023	Optical noise in passive optical networks. (Szum optyczny w pasywnej sieci optycznej.)	Assessment of noise sources in optical fiber paths of a passive optical network. Design a fiber optic noise model with a given configuration. Develop calculation procedures for the presentation of optical noise in an optical fiber path with a selected number of noise sources.	1
19	Dr inż. J. Szóstka Room 116	Design of the Bi-Quad Antenna for 2.4 GHz and 5 GHz WLAN Bands.	The work comprises design, construction, and measurements (VSWR, gain) of the bi-quad antenna prototype for WLAN bands. Profile of the thesis: construction&measurements	1
20	Dr inż. A. Wardzińska Room 105	Laboratory station for electromagnetic wave properties. (Przygotowanie ćwiczenia laboratoryjnego ukazującego własności fali elektromagnetycznej).	Prepare the laboratory station to show the basic electromagnetic wave properties. There should be implemented (eg in C++, Java) the application showing phenomena such as wave propagation in free space, reflection, refraction, Brewster's angle, etc., and checking the acquired knowledge at the end of performed exercise.	1-2
21	Dr hab. inż. M. Wawrzyniak Room 135	Implementation of Windows drivers with the WDK. Zastosowanie WDK do implementacji sterowników Windows.	The aims of the work: presentation of the driver implementation rules with the Windows Driver Kit, implementation of drivers for selected USB bus devices. C ++ programming skills and knowledge of MS Visual Studio are required.	1

MASTER THESIS, ICT
Due date: 15th of September 2023

1	Prof. dr hab. inż. M. Domański Room 102b	Application of deep neural networks in video compression or visual object recognition. (Zastosowanie głębokich sieci neuronowych w kompresji wizji/rozpoznawaniu obiektów).	The aim of the work is to demonstrate how deep neural networks may be used for compression or visual object recognition. Standard software packets for deep neural networks may be used in the experiments with test images or video clips. The project may also be aimed at action recognition.	1
2	Prof. dr hab. inż. M. Domański Room 102b	Sportsmen/sportswomen motion analysis from multiview video. (Analiza ruchu sportowca wykorzystująca ruchome obrazy wielowidokowe).	Preparing a method and a program for determining motion of sportsmen/sportswomen with the use of optical methods with no need to stick the markers. A program may use the software for multiview video processing and analyzing, developed in the Chair of Multimedia Telecommunications and Microelectronics. A student must do the experiments, as well as compare the developed method with other methods for sportsmen/sportswomen motion analysis.	1
3	Dr inż. A. Dziembowski Room 139	Pixelrate reduction for Immersive Video coding.	The goal of the thesis will be to create a method which allows reduction of pixelrate of Immersive Video (i.e. 360º video of virtual reality), i.e. to losslessly reduce the number of pixels needed for representing the video being encoded.	1

4	Dr inż. P. Górniak Room 105	A planar antenna array for a 3.8GHz center frequency. (Planarny układ antenowy na częstotliwość pracy 3,8 GHz).	Design and construction work. The theoretical part of the work will focus on presenting planar antenna arrays as candidates for 5G wireless systems. The practical part of the work will target the design of a few antenna arrays for 3.8GHz frequency band and realization of the antenna arrays in the PCB technology.	1
5	Dr inż. T. Grajek Room 137	Using Region of Interest (ROI) for local image quality adjustment.	Use ROI(s) to apply local (within picture) differentiation of image quality. Areas inside ROI(s) should be encoded with higher quality (lower QP) and remaining picture area as SKIP mode. Preferred codec: VVC.	1
6	Dr inż. D. Karwowski Room 118	Method for efficient bit allocation in a VVC video encoder. (Metoda efektywnej alokacji bitów w koderze wizyjnym VVC).	Development of a bit allocation method in the VVC video encoder, that allows encoding with a better quality of the indicated image area. Software implementation of the method in the reference software of the VVC video codec. Performance tests of the developed method.	1
7	Dr inż. M. Kasznia Room 122	Implementation of the methods of the real-time Maximum Time Interval Error assessment. (Realizacja metod wyznaczania maksymalnego błędu przedziału czasu sygnałów synchronizacji w czasie rzeczywistym).	Project thesis, programming skills required. Thesis goal: implementation and testing of the methods of the Maximum Time Interval Error assessment, performed in the real time, during the time error measurement process.	1
8	Dr inż. K. Klimaszewski Room 108	Device for localization of objects based on their weight and size. (Urządzenie do lokalizacji przedmiotów na podstawie ich wagi i wymiaru.)	The aim of this work is to develop a method for the use of the Velostat foil to locate the objects. The resistance values that are measured should be feed to a neural network. The training of the neural network is to be conducted using a machine vision system.	1
9	Dr inż. K. Klimaszewski Room 108	Miniature depth camera. (Miniaturowa kamera głębi.)	The aim of the work is to build a depth camera using the Time of Flight principle. The camera is supposed to use ready-made modules and use the data from the module to construct a low resolution depth map. The work comprises of building the device, developing the software for camera control and characterizing the performance of the device.	1
10	Dr inż. S. Maćkowiak Room 103	A system for generating descriptions in natural language for images. (System generujący dla obrazów opisy w języku naturalnym).	The work aims to create a tool for the automatic classification of objects and areas in pictures using a deep learning network. The thesis requires programming skills. Ability to use OpenCV image processing library, TensorFlow library, Keres, cuDNN, Torch package.	1
11	Dr inż. S. Maćkowiak Room 103	Object classification system using artificial neural networks and CDVS descriptors. (System klasyfikacji obiektów z wykorzystaniem sztucznych sieci neuronowych oraz deskryptorów CDVS.)	The work aims to develop a product classification system (offered in a wending machine), which will use image processing with the use of neural network and CDVS video descriptors. The system should operate efficiently in real-time, using a small computing unit and a simple camera. The thesis requires programming skills. Ability to use OpenCV image processing library, TensorFlow library, Keres, cuDNN, Torch package.	1-2
12	Dr inz. Ł. Matuszewski Room 124	Phisical Unclonable Function in FPGA.	It is necessary to implement in the FPGA system the non-clonical PUF logic function and examine its properties and responses to various re-quirements.	1

13	**Dr inż. S. Michalak** **Room 130**	**Satelitte tracking software.**	**Program for determining and visualizing satellite position Write a program that allows graphic presentation of the route of a selected satellite against the background of the Earth map, with the possibility of updating data (making corrections).**	**1**
14	**Dr inż. S. Michalak** **Room 130**	**Real-time analysis system of data from the balancing robot's measuring sensors.**	**Design and make a system analyzing data from measuring sensors placed on the platform of a two-wheeled balancing robot.**	**1**
15	**Dr inż. D. Mieloch** **Room 139**	**The video-based automatic score counting for basketball games. (Automatyczne zliczanie punktów w rozgrywkach koszykówki na podstawie sekwencji wizyjnej).**	**The goal of the proposed topic is to prepare the method of automatic score counting for basketball. The tests of the method will be performed on the acquired basketball games, the knowledge of the C++ is required.**	**1**
16	**Dr inż. J. Nikonowicz** **Room 124**	**Noise power estimation in intermittent transmission.**	**Comparative analysis of techniques for estimating noise power under conditions of packet transmission. Simulation project based on a review and performance evaluation of available solutions.**	**1**
17	**Dr inż. O. Stankiewicz** **Room 117**	**Digital signal analyzer on FPGA.**	**The goal of the work is to develop an FPGA-based module allowing for reading of commonly used inter-device communication protocols.** **Required functionality: high speed I2C, high speed SPI, high spped UART, synchronous parallel communication.** **The module should be able to store the captured data and then transfer it to PC computer for analysis. Also software, allowing interpretation of the protocols on PC should be provided.** **Language: Verilog, C++**	**1**
18	**Dr inż. P. Stępczak** **Room 023**	**Techniques for monitoring optical paths in new generation passive networks. (Techniki nadzorowania optycznych traktów w pasywnych sieciach nowej generacji.)**	**Consideration of measuring methods for optical paths with splittng elements. Development of the concept of the optical track monitoring system in NG-PON, enabling immediate fault location. Assessment of fault detection methods in NG-PON optical paths.**	**1**
19	**Dr inż. J. Szóstka** **Room 116**	**Propagation prediction with the ITU-R P.1812 method. (Obliczenia propagacyjne za pomocą metody ITU-R P.1812).**	**The thesis comprises familiarizing with the ITU-R P.1812 method, development of the propagation simulation algorithm and software, and the design of a simple radio communication system. Profile of the thesis: theoretical/software design.**	**1**
20	**Dr inż. A. Wardzińska** **Room 105**	**Nonuniform transmission line models. (Modele linii transmisyjnej niejednorodnej).**	**The aim is to prepare and implement in Matlab/C++ and SPICE nonuniform transmission line basing on chosen calculation models.**	**1**
21	**Dr hab. inż. M. Wawrzyniak** **Room 135**	**Distributed measuring system for monitoring air quality.** **Rozproszony system pomiarowy do monitorowania jakości powietrza.**	**The goal of the work is to design and launch the prototype of the distributed measuring system for monitoring air quality. The scope of the thesis involves also a review of air quality parameters, selection of measured parameters and verification of selected system properties. Required programming skills in C ++.**	**1**