List of subjects for the semester project:

1. **(1 student) Edge detection from color images.**
   - a set of BMP color images (24 bits/pixel) is given;
   - you'll study and implement a color edge detection algorithm (based on the Canny algorithm).

2. **(1 student) Line detection from grayscale images.**
   - the Hough transform for lines will be studied;
   - all the edges will be extracted from the grayscale image (using Canny algorithm);
   - the lines of great length will be detected;
   - you'll display the Hough space and draw all the detected lines over the initial grayscale image.

3. **(2 students) Romanian vehicle license plates detection from color images.**
   - color images of vehicles (at different distances) with visible license plates are given (the license plates can be a little bit rotated to the horizontal direction);
   - you'll implement an algorithm to identify and mark the areas where the license plates are found.

4. **(2 students) FELICS lossless compression algorithm for BMP grayscale images (with 8 bits/pixel).**
   - you'll study the lossless compression algorithm FELICS (Fast Efficient & Lossless Image Compression System);
   - you'll implement the algorithm and then test the compression and decompression of BMP grayscale images (with 8 bits/pixel) using this algorithm.

5. **(1 student) Zooming and shrinking in digital images.**
   - you'll study and implement the zoom and shrink techniques (at any scale) applied for digital images (grayscale with 8 bits/pixel);
   - the advantages and disadvantages of them will be highlighted.

6. **(2 students) Region-based grayscale images segmentation.**
   - you'll study and implement the *region growing* segmentation technique;
   - you'll study and implement the *region splitting and merging* segmentation technique.

7. (2 students) Texture-based grayscale images segmentation.

- you'll study texture-based images segmentation methods from the existing literature;
- you'll implement only one technique.

8. (2 students) Movement detection from a grayscale images sequence by computing the optical flow.

- a sequence of grayscale images is given;
- you'll study and implement a method for computing the optical flow;
- the movement vectors from the successive frames will be drawn.

9. (2 students) Comparison between the objects' skeleton extraction techniques.

- you'll study and implement the skeleton extraction method using morphological *thinning*;
- you'll study and implement the skeleton extraction method using the *medial axis transform* applied on the *distance transform* image of the binary objects image.

10. (1 student) Interesting special effects on color images.

- you'll study some interesting special effects that can be applied on color images;
- you'll implement a set of them (the number depends on their difficulty).

11. (1 student) Objects' corner detection from grayscale images.

- you'll study some objects' corner detection algorithms;
- you'll implement one objects' corner detection algorithm from grayscale images.

12. (1 student) Red-eye detection and removal from digital images.

- you'll previously select the area on the image where the eyes are placed (rectangle selection);
- you'll study and implement a method for red-eye detection from that selected area;
- if necessary, a red-eye removal will be applied.

13. (2 students) Car detection from grayscale images.

- a set of images having some objects already marked (knowing the surrounding rectangle) is given;
- you'll study some classification methods for determining if they are cars or other objects;
- you'll implement one technique which satisfies the requirements.

14. (2 students) Generating random noise in grayscale images.

- you'll implement an algorithm to generate random Gaussian noise with a specified mean and variance;
- you'll implement an algorithm to generate random salt and pepper noise with a specified occurrence probability;
- these noises will be applied on images;
- you'll filter the obtained noisy images with corresponding computed filters to demonstrate that the noise generating process was correct.

15. (2 students) Traffic road signs detection.

- scene color images containing traffic road signs with circular, triangular or rectangular shape are given;
- you'll study and implement a method to detect all the traffic road signs that appear in the images;
- the result consists in marking of all the detected traffic road signs (or areas where they are located) over the original scene images.

16. (2 students) Image conversions from BMP to JPG/PNG format and reverse (you'll choose only one of those two formats JPG or PNG).

- BMP images are given, you'll implement and test the conversion algorithm to JPG/PNG format;
- JPG/PNG images are given, you'll implement and test the conversion algorithm to BMP format;

17. (1 student) Polygonal approximation of objects' contours.

- images containing the extracted contours of multiple objects are given;
- you'll study some polygonal contour approximation algorithms;
- you'll implement one algorithm to approximate each object contour with polygonal segments by considering a user-defined precision threshold.

18. (2 students) Building a panoramic image.

- a color image set (BMP with 24 bits/pixel) will be acquired by photographing a scene in round about manner;
- you'll study some merging/overlapping and edge cutting techniques of these images for obtaining the scene panoramic image;
- you'll choose and implement one of these techniques;
- the result will consist in a panoramic image of the scene.

19. (2 students) Building a mosaic image.

- a color image (BMP with 24 bits/pixel) and a large set of color images with smaller size (usually having same size) are given;
- the initial image will be divided in small rectangular areas having the size equal to the size of the images from that large set;
- some images from that large set will be chosen and putted in the best positions over the small rectangular areas of the divided initial image;
- the resulted mosaic image should best approximate the original image's view.

20. (2 students) Image restoration.

- a color degraded image (BMP with 24 bits/pixel) is given;
- you'll study some image restoration techniques;
- you'll choose and implement one of these techniques that covers the detection of the degraded areas, finding/solving the problems in those areas and finally trying to enhance the image;
- the result should be a restored image.

21. (2 students) Making 3D movies.

- a sequence of stereo (left and right cameras) grayscale images is given;
- you'll study the method of making an anaglyph image by combining the left and right images (finding also an approximation of the depth for each pixel – depth map);
- the result consists in a video sequence with all the anaglyph frame images.