Blekinge Institute of Technology
Department of Computer Science

Revision: 1
Reg.no: BTH-4.1.14-0333-2020

COURSE SYLLABUS

Digital bildbehandling

Digital Image Processing

5 credits (5 higher education credits)

Course code: DV2592
Main field of study: Computer Science
Diciplinary domain: Technology
Education level: Advanced level
Specialization: A1N - Second cycle, has only first-cycle sourse/s as entry requirements

Subject area: Computer Technology
Language of instruction: The language of instruction is English.
Applies from: 2020-08-31
Approved: 2020-06-03

1. Decision

This course is established by Dean 2019-11-21. The course syllabus is approved by Head of Department of Computer Science 2020-06-03 and applies from 2020-08-31.

2. Entry requirements

Admission to the course requires a Bachelor of Science in Computer Science, Computer Engineering, Electrical Engineering or similar area.

3. Objective and content

3.1 Objective

The purpose of this course is to give the student an introduction and hands-on approach to the field of image processing and analysis.

3.2 Content

Humans are primarily visual creatures that depend on their eyes for most of the information received about our environment. This dependency in our daily routine is even reflected on how we set and pursue technical objectives. For instance, scientific devices commonly produce images to communicate their results, which need to be verified or processed. The utilization of some modern mechanical and medical devices requires knowledge of several disciplines, among which is the fascinating image processing discipline. Image processing has its origins in engineering, more specifically in signal processing. Computer vision and pattern recognition have benefited a lot from the image processing field and have all undergone substantial development over the past ten years. However, the large scientific leap came when machine learning invaded the image processing and analysis area propelling the latter discipline to the forefront in different applications. The emphasis throughout the course will be on explaining and illustrating methods so that they can be clearly understood, rather than providing the dense underlying mathematics. This is an introductory level course on the science of image processing, which employs programming to illustrate some of the elementary, key concepts in modern image processing and pattern recognition.
The topics to be covered are:

- Intensity Transformations and Spatial Filtering
- Color Image Processing
- Image bit-planes manipulation for security
- Wavelet Image Transformation
- Morphological Image Processing
- Image Segmentation
- Feature Extraction
- Image Pattern Matching and Classification.

4. Learning outcomes

The following learning outcomes are examined in the course:

4.1 Knowledge and understanding

On completion of the course, the student will be able to:

- have acquired knowledge of the digital image processing and analysis field required at a basic level.

4.2 Competence and skills

On completion of the course, the student will be able to:

- structure and conceptualize a solution based on a description of an image-based problem.
- independently develop an algorithm to address an image-based problem of limited scope.
- have the ability to develop a solution to a programmable image-based problem of limited scope using the concepts, components and MATLAB programming tools used in the course.

5. Learning activities

The course is offered as a distance online course.
The BTH learning platform is available for support, where course materials are distributed and information concerning the course is published.
The detailed study guide contains reading instructions for the textbook and a set of study exercises to work with. The course has normally a theme each week. The students carry out exercises and compulsory assignments in connection with that theme. Students store their completed assignments in the learning platform, where the teacher gives feedback on the assignments.
Specific for students studying at distance: Interactive exercises can be conducted via the Internet, for example via the conference system or the BTH learning platform.
Students who are unable to attend these conference sessions will be able to download recordings of these meetings.
Communication is also available via email.

6. Assessment and grading

Modes of examinations of the course

Code	Module	Credits	Grade
2010	Written assignment 1	1 credits	GU
2020	Written assignment 2	1.5 credits	GU
2030	Project assignment	2.5 credits	GU

The course will be graded G Pass, UX Insufficient, supplementation required, U Fail.

An examiner can, after consulting the Disability Advisor at BTH, decide on a customized examination form for a student with a long-term disability to be provided with an examination equivalent to one given to a student who is not disabled.

The course information for each course revision should include the assessment criteria and make explicit in which modes of examination that the learning outcomes are assessed.

7. Course evaluation

The course evaluation should be carried out in line with BTH:s course evaluation template and process.

8. Restrictions regarding degree

The course can form part of a degree but not together with another course the content of which completely or partly corresponds with the contents of this course.

9. Course literature and other materials of instruction

Main literature:
Digital Image Processing using MATLAB
Author: Gonzalez/Woods/Eddins
Publisher: Gatesmark Publishing.
Year: 2009 (2nd Edition)
Number of pages: 827
ISBN: 9780982085400.

Reference literature:
Digital Image Processing
Author: Rafael C. Gonzalez, and Richard E. Woods
Publisher: Pearson
Year: 2017 (4th Edition)
Number of pages: 1192
ISBN: 978-0133356724.

Feature Extraction and Image Processing for Computer Vision.
Author: Mark Nixon and Alberto S. Aguado Publisher: Elsevier Science Publishing Co Inc
Year: 2019, 4th edition

Number of pages: 628

ISBN: 9780128149768
All other course material will be available at BTH learning platform.