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**Bachelor in Electronics and Instrumentation**

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**MODULE HANDBOOK**

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|---|---|
| Module name | **Computer Vision** |
| Module level | Undergraduate |
| Code | MII-3316 |
| Courses (if applicable) | Computer Vision |
| Semester | Even (Genap) |
| Contact person | Prof. Drs. Agus Harjoko, M.Sc., Ph.D. |
| Lecturer | 1. Prof. Drs. Agus Harjoko, M.Sc., Ph.D.<br>2. Ika Candradewi, S.Si., M.Cs. |
| Language | Bahasa Indonesia/English |
| Relation to curriculum | 1. Undergraduate degree program, elective, 5th semester.<br>2. International undergraduate program, elective, 5th semester. |
| Type of teaching, contact hours | 1. Undergraduate degree program: lectures, < 60 students,<br>2. International undergraduate program: lectures, < 30 students. |
| Workload | 1. Lectures: 3 x 50 = 150 minutes (2 hours 30 menit) per week.<br>2. Exercises and Assignments: 3 x 50 = 150 minutes per week.<br>3. Self-study: 3 x 50 = 100 minutes per week. |
| Credit points | 3 credit points (sks). |
| Requirements according to the Examination regulations | A student must have attended at least 70% of the lectures to sit in the exams. |
| Recommended prerequisites | Computer programming skill |
| Learning outcomes (course outcomes) and their corresponding PLOs | After completing this module, a student is expected to:<br>CO1 Able to explain the concept of computer vision, human vision, camera model, light and color space.<br>CO2 Able to explain, design, and implement filtering techniques in the spatial and frequency domains<br>CO3 Able to explain, design, and implement point, line and corner detection techniques<br>CO4 Able to explain, design, and implement techniques for detecting |

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and extracting features of objects.<br>
CO5 Able to explain, design, and implement simple object detection, classification, or recognition techniques<br>
CO6 Able to work together to solve computer vision problems<br><br>
<table>
<tr><th colspan="2">PLO</th><th>CO1</th><th>CO2</th><th>CO3</th><th>CO 4</th><th>CO5</th><th>CO6</th></tr>
<tr><td rowspan="5">Program Learning Outcome (PLO)</td><td>PLO1</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>PLO2</td><td>√</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>PLO3</td><td></td><td>√</td><td>√</td><td>√</td><td>√</td><td></td></tr>
<tr><td>PLO4</td><td></td><td>√</td><td>√</td><td>√</td><td>√</td><td></td></tr>
<tr><td>PLO5</td><td></td><td></td><td></td><td></td><td></td><td>√</td></tr>
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<tr><td>Contents</td><td>
1. Introduction to Computer Vision<br>
2. Image Filtering, Edge and Corner Detection<br>
3. Image Transformation & Image Homografies<br>
4. Feature Detector and Descriptor<br>
5. Geometric Camera Model<br>
6. Two View Geometry<br>
7. Stereo<br>
8. Image Classification (Linear Model) & Visual Object Recognition<br>
9. Neural Network & Back propagation<br>
10. Convolutional Neural Network<br>
11. Object Localization & Detection<br>
12. Object Tracking : Optical Flow, Alignment and Tracking<br>
13. Image Segmentation<br>
14. 3D and Depth Stereo Vision (Optional)<br>
15. Final Project
</td></tr>
<tr><td>Study and examination requirements and forms of examination</td><td>
The evaluation is planned in 3 forms, namely:<br>
1. Exam, either midterm or end of term test,<br>
2. Individual assignments to be completed within a certain timeframe, and<br>
3. Two quizzes, held on face-to-face, once before midterm exam and once after midterm exam, with a short answer form.<br>
4. Term project<br><br>
Assessment is done using benchmark assessment, with the aim of measuring the level of student understanding related to the target and class rank.
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<tr><td>Media employed</td><td>LCD, blackboard, and websites.</td></tr>
<tr><td>Assessments and</td><td></td></tr>
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Evaluation

| Type | Percentage | CO1 | CO2 | CO3 | CO4 | CO5 | CO6 |
|---|---|---|---|---|---|---|---|
| Quiz | 5 % | √ | √ | √ | | | |
| Individual Task | 20 % | | √ | √ | √ | √ | |
| Project Task | 15 % | | | | | | √ |
| Midterm Exam | 30 % | √ | √ | √ | | | |
| Final Exam | 30 % | | | √ | √ | √ | |
| **Total** | 100% | | | | | | |

Reading List


[1]. R. Szeliski, Computer Vision: Algorithms and Applications, 2nd Edition, Springer, 2021.

[2]. Bogusław Cyganek and J. Paul Siebert, *An Introduction to 3D Computer Vision Techniques and Algorithms,* John Wiley & Sons, Ltd. ISBN: 978-0-470-01704-3, 2009

[3]. R.C. Gonzalez dan R. Woods, *Digital Image Processing*, Addison Wesley, 2008.

[4]. R.J. Schalkoff, *Digital Image Processing and Computer Vision*, John Wiley & Sons, 1989

[5]. R. Jain, R. Kasturi, B.G. Schunck, *Machine Vision*, McGraw-Hill, 1995.

[6]. Situs kuliah Computer Vision, Dept. of Electrical and Computer Engineering, University of Wisconsin, USA, http://pages.cs.wisc.edu/~mohitg/courses/CS766/

[7]. Situs kuliah Computer Vision di University of Princeton, https://www.cs.princeton.edu/courses/archive/fall17/cos429/

[8]. Informasi dan sumber data di http://kdd.ics.uci.edu/.

[9]. Informasi dan sumber data di http://kaggle.com

[10]. Trevor Hastie, Robert Tibshirani, Jerome Friedman. The Elements of Statistical Learning 2nd ed. Springer, 2017

[11]. David Fouhey, Computer Vision Course, EECS 442, University Michigan

[12]. Mathew, O'othole, Computer Vision Course, 16-385, Spring 22, Carnegie Mellon University , Computer Vision : Spring 2022 (cmu.edu)