

课程编号: **99911217**

课程名称: 信号处理与计算机视觉 (全英文)

1. 课堂讲授学时 **Lecture Hours: 32**
2. 课堂实验学时 **Laboratory Hours: 0**
3. 课下研讨学时 **Colloquia Hours: 0**
4. 学生课下投入学时 **Individual Study Hours: 16**
5. 学分 **Credits: 2**
6. 开课学年学期 (如果有强制性的要求则必须填, 否则可以不填) **Occurrence: Summer Course, 2<sup>nd</sup> year, 3<sup>rd</sup> year, 4<sup>th</sup> year**
7. 先修课程 **Prerequisite(s):** 必须先修的课程直接写课程编号和课程名称, 建议先修的课程在课程名称后用\*号标注, 并在下一行注明:
8. 课程概要 **Course Description:** 100 字以内, 学习内容以学术关键词出现。

The aim of this course is to provide an introduction to the fundamental principles of digital signal processing, digital image processing, and computer vision. Students will have the opportunity to learn various theories including Fourier Transform, Spectrum Analysis, Image Formation, Image Geometry, Generation and Representation, and Camera Calibration. Additionally, they will be able to enhance their theoretical, analytical, investigative, and practical skills through a series of case studies, group work, and presentations. These activities will also allow students to understand how the theories and technologies in signal, image, and vision processing can be applied to address real-world problems.

9. 课程预期学习成果 **Course Outcomes:** 用数字 1 到 9 列出每一项主要学习成果
  1. Evaluate and analyse the interface between the analogue domain and the digital domain , e.g. complex plane analysis in both domains.
  2. Design, analyse, select, and apply 1-D and 2-D digital filters (e.g. z-plane analysis using poles and zeros, representation using transfer function, linear difference equation, signal flowgraphs, convolution masks etc., and implementation using appropriate methods including computer-based simulations).
  3. Create, and analyse the performance of, processing systems for digital signals and/or images for particular practical applications based on analysis of the signals/images using an appropriate fast prototyping software development platform.
  4. Produce design briefs, specifications and concepts for computer vision systems.
  5. Develop an awareness of research areas in computer vision.

6. Research, select and review appropriate literature.

10. 教学内容与学时分配 **Course Content, Laboratories and Laboratory Hours** (有则填, 没有则不填), **Colloquia Hours** (有则填, 没有则不填):

**1. Digital Signal Processing – 12 hours**

1.1 Signal representation and analysis methods

1.2 Fourier transform and spectrum analysis

1.3 Digital filter design and implementation

**2. Vision Processing/Computer Vision – 8 hours**

2.1 Introduction to computer vision

2.2 Image formation process

2.4 Image manifold and features

**3. Digital Image Processing – 12 hours**

3.1 Image representation and analysis methods

3.2 Image geometry

3.3 Image acquisition, generation and representation

3.4 Basic image enhancement

3.4 Image manifold and features

**11. 考核与成绩评定 Grading:**

Group case study: 50%

Group Presentation: 50%

12. 教材, 参考书 **Text & Reference Book:** 作者, 书名, 版本, 年份, 国际标准书号 ISBN

- Terrell, T. J. & Shark, L. (1996), Digital signal processing : a student guide, Macmillan, Basingstoke, ISBN 0333637194
- Rabiner, L.R. (1975), Theory and application of digital signal processing, Prentice Hall, Englewood Cliffs; London, ISBN 0139141014
- Proakis, J.G. (1996), Digital signal processing: principles, algorithms, and applications, 3rd ed., Prentice-Hall International (UK), London, ISBN 0133942899
- Ifeachor, E.C. & Jervis, B.W. (1993), Digital signal processing : a practical approach, Electronic Engineering Series, Addison-Wesley, ISBN 020154413x
- Terrell, T.J. (1998), Introduction to digital filters, 2nd ed., Macmillan Education, ISBN 0333443225
- Ludeman, Lonnie C. (1986), Fundamentals of digital signal processing, Harper & Row, New York, London, ISBN 0471603635
- Castleman, K.R. (1996), Digital Image Processing, Prentice Hall; London, ISBN 0133980588
- Schalkoff, R. J. (1989), Digital Image Processing and Computer Vision, Wiley, ISBN 0471857181

- Klette, R. (2014), Concise Computer Vision, Springer, ISBN-13: 978-1447163190
- Szeliski, R. (2011), Computer Vision Algorithms and Applications, Springer, ISBN: 1868-0941
- Trucco E., Verri A. (1998), Introductory Techniques for 3-D Computer Vision, Prentice-Hall,
- ISBN:0132611082
- Sonka M., Hlavac V., & Boyle R. (2008), Image Processing, Analysis, and Machine Vision, PWS
- Publishing, ISBN: 10:0-495-24438-4
- Jahne B. & Haubecker H. (2000), Computer Vision and Applications a Guide for Students and
- Practitioners, Academic Press, ISBN:0123797772

### 13. 编写教师 **Course Lecturer:**

Dr. Wei Quan

编写教师 **Course Lecturer** (签字) :

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