Master CIMET COLOR IN INFORMATICS AND MEDIA TECHNOLOGY

Semester 3 at University of Eastern Finland – Course Catalogue autumn 2011

(For most up-to-date information, please contact the course teacher or see the WebOodi system: https://wiola.uef.fi/weboodi/frame.jsp?Kieli=6&valittuKieli=6 -> search)

Computational Color, 3621520, 5 ECTS

Course manager: Prof. Jussi Parkkinen, jussi.parkkinen@uef.fi

Course home page/description online: http://cs.joensuu.fi/pages/parkkinen/compcol/syk10/

Learning Outcomes:

After completing the course, students understand the basic concepts of spectral color representation and relation of spectral space to the standard color coordinate systems. Students understand the possibilities and problems in accurate color reproduction and some basic methods to reproduce a color spectrum from the color RGB-values. Students also understand the use of some mathematical methods like PCA, NMF, and NTF in color spectrum analysis, compression and color reproduction. Student will have skills for practical implementation and use of the above mentioned methods for color management in the spectral color space.

Topics:

- Spectral color representation
- Models for color signal
- Basic ideas of spectrum estimation
- Wiener estimation methods
- Principal Component Analysis
- Non-negative Matrix Factorization
- Non-negative Tensort Factorization
- Color spectrum reconstruction

Teaching Methods:

- Lectures
- Project work

Forms of Assessment: Written exam 3 hours; 75% written exam, 25% excercises and project work

Grading Scale:

- Grades 1 – 5 (best), transferred into: Alphabetical Scale, A (best) – F (fail)

External/internal examiner: Internal examiners evaluate the exam

Re-sit examination: Written exam: ordinary re-sit examination

Examination support: English dictionary.

Coursework Requirements: Personal small project works must be completed.

Teaching Materials: lecture notes and research articles

Special course in color science, 5 ECTS

Learning outcomes:

After completing the course, the student will have a good understanding about organization and outputs of research in color science. He/she has an overview about the different research topics in the color science, idea about the ways to publish research, and understanding of differences in publishing forums. He/she has a basic knowledge of experiment design and statistical analysis of human experiments in color science, about project management, and scientific writing in English.

Topics:

- Introduction to project management
- Basics of English in Scientific Writing
- Research topics in color science
- Basics of experiment design and statistical analysis of results
- Literature search for research project

Teaching methods: Lectures, seminar sessions, and practical exercises, lectured in English

Form of assessment: Attendance on teaching and evaluation of practical exercises

Grading scale: Pass/Fail

Coursework requirements: Personal exercises, article reading, and small reports

Teaching material: Scientific articles and lecture notes

Teachers: Professor Jussi Parkkinen, Professor Juha Alho, Professor Markku Tukiainen, English teacher

Spectral Imaging Devices, 3312031, 5 ECTS

Course manager: Dr. Pertti Silfsten, pertti.silfsten@uef.fi

Learning Outcomes:

After completing this course, the student should know how spectral imaging and non-imaging data is produces using different methods.

The student will be able to use different measuring systems. Also the applicability of different systems for different kind of samples should be understood. The student will also be familiar with different calibration methods of relative and absolute measuring systems.

Topic(s): Imaging and non-imaging spectral measurement systems

- -Spectrophotometer
- -Spectroradiometer
- -Bispectrometer
- -Imaging camera
- -LTCF
- -Digital camera
- -LCSLM-LVF system

Teaching Methods:

Lectures

Laboratory work including measurement of given samples using different measurement systems.

Presentation in seminar and written report on the given subject.

Forms of Assessment: Written exam, 2 hours

Forms of Assessment (additional text):

The grade is composed: 50% written exam, 50% report/presentation

Grading Scale:

- Grades 1 – 5 (best), transferred into: Alphabetical Scale, A (best) – F (fail)

External/internal examiner: Internal examiner

Re-sit examination: Written exam: ordinary re-sit examination

Examination support: English dictionary.

Coursework Requirements: Presentation given in the seminar and report written in given subject. Measurement results of given samples must be presented before access to the exam.

Teaching Materials :

Textbook:

- -Wyszeski&Stiles: Color Science

Other:

- -Manuals of different measuring systems.
- -Publications containing information of some measurement systems.
- - Labsphere publications : A Guide to Integrating Sphere Radiometry and Photometry, Integrating Sphere Uniform Light Source Applications, A Guide to Integrating Sphere Theory and Applications

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Display Technologies, 3312025, 5 ECTS

(Course manager: Dr. Pertti Silfsten, pertti.silfsten@uef.fi)

Learning Outcomes:

After completing the course, students understand the basic concepts of display systems in general. Students will understand the main display technologies now in markets. These include CRT,LED,EL,LCD,FED,SED, plasma, micro, and projection displays. Future flexible and flat panel displays should also be understood.

Topic(s) :

- Basic Concepts of Display Systems
- Visual System
- Performance Requirements
- Display Technologies
- Projection Displays
- Plasma Displays
- Liquid Crystal Displays
- OLED and other Flexible Displays
- Standards

Teaching Methods:

- Lectures
- Laboratory work
- Project work

Teaching Methods (additional text, if needed):

Forms of Assessment: Written exam 4 hours

Forms of Assessment (additional text):

75% written exam, 25% excercises and project work

Grading Scale:

- Grades 1 – 5 (best), transferred into: Alphabetical Scale, A (best) – F (fail)

External/internal examiner: Internal examiners evaluate the exams

Re-sit examination: Written exam: ordinary re-sit examination

Examination support: English dictionary.

Coursework Requirements: 20 hours laboratory demonstrations are mandatory. A private project work must be completed, too.

Teaching Materials : lecture notes

CIMET Project Contest, 3621611, 5 ECTS

Course manager: Prof. Markku Hauta-Kasari, markku.hauta-kasari@uef.fi

Common to all specializations

Optional Courses:

Elementary Finnish for students of the International Master's Program in Information Technology (IMPIT), (Note, also for CIMET students), 8015001, 5 ECTS

Learning Outcomes: The course *Elementary Finnish* introduces students to the basics of the Finnish language and culture. The course aims at giving students the elementary language skills needed in everyday life and studies in Finland.

After the completion of the course the students will be able to
- use Finnish in everyday communication situations
- talk about matters related to themselves and their lives as well as ask and give information
- understand and produce simple spoken and written messages
- manage short conversations
-understand the most important characteristics of the Finnish language and the basic aspects of Finnishness

Topic(s) :

During the course the students will:
- practise the speaking, writing and understanding of spoken and written discourse

- learn and practise language structures, vocabulary, and communication situations

- Basics of pronunciation (stress, intonation, quantity opposition, diphthongs and clusters)
- Greetings and polite phrases
- Introducing oneself, asking and giving information
- Basic vocabulary and common phrases related to living and studying in Finland (numbers, time, days of the week, months, seasons, colours, family, food, clothes, shopping, hobbies, weather, own study field)
- Basic grammar (vowel harmony, verb conjugation in the present tense, consonant gradation, word order, common sentence types, genitive, partitive and local cases)
- Basic information about Finnish culture (a visit to the Carelicum museum, baking sweet buns (pulla), Finnish music)

Teaching Methods: Contact teaching lessons 60 hours, guided independent work 75hours. The methods will include oral and written pair and group exercises, games and independent work. Emphases on communicative skills.

Form(s) of Assessment: Vocabulary tests during the course and continuous assessment (active participation). The final exam consists of five parts A) comprehension of speech, B) speaking, C) structures and vocabulary, D) text comprehension, and E) writing. Each part of the final exam will be assessed separately and the result made up of the average score.

Grading Scale:

- 5 (best) –0 (fail) (-> A-F)

External/internal examiner: internal examiner

Re-sit examination: The students may re-sit the exam once.

Examination support: -

Coursework Requirements:

- 2 absences allowed: 4*45 min
- Assignments: exercises, written and oral tasks (e.g. compilation of vocabulary, an interview)

Teaching Materials : Provided by the teacher

Innovation Month (5 ECTS)

Course co-organized with the North Carelia University of Applied Sciences, more information in: http://www.acehanke.fi/en/frontpage/

Research Methods in Computer Science (5 ECTS), 3621513

Course home page/description online:
http://cs.joensuu.fi/pages/suhonen/RM2010/index.html

Learning Outcomes:

After the course, the students

- are familiar with a scientific research process in Computer Science
- are aware and appreciate different research methods in Computer Science
- are capable of identifying assumptions, limitations and premises of different research approaches and methods
- are aware of the ethical aspects of research designs and dissemination mechanism in Computer Science.

Topic(s):

The course consist of five study modules

- Module 1: Introduction to Scientific Research in Computer Science
- Module 2: Quantitative Research Methods in Computer Science
    - surveys
    - controlled experiments
    - statistical methods
- Module 3: Research Methods in Algorithmic Computer Science
    - analytic-deductive methods: role of abstraction and deduction, focal algorithmic issues: correctness and complexity, classical examples of deductive tools
    - experimental methods: principles of good experimental research, guidelines for experimental algorithmic, examples of algorithm experimentation
- Module 4: Qualitative and Mixed Methods Research in Computer Science
    - case studies
    - ethnography
    - phenomenography
    - grouded theory
    - narrative research
- Module 5: Family of Design and Development Research Methods
    - action research
    - design research
    - constructive (formative) research

Teaching Methods: Lectures, exercises

The course has three teachers: Markku Tukiainen, Pekka Kilpeläinen and Jarkko Suhonen

Form(s) of Assessment

Weekly exercises, portfolio and research plan.

Form(s) of Assessment (additional text)

The course grade will consits of the following three parts

1. Exercises of Study Modules 1-2 and 4-5, 50%
2. Study portfolio held during the whole course, 30%
3. A research plan created after the course, 20%

Grading Scale

- Grades 0 – 5 (best), transferred into: Alphabetical Scale, A (best) – F (fail)

External/internal examiner: Internal examiners

Teaching Materials:

Online learning materials, lecture notes. Literature: Fincher & Petre (2004) Computer Science Education Research; Olivier (2009) Information Technology Research; Creswell (2003) Research Design: Qualitative, Quantitative, and Mixed Methods Approaches (2nd. Ed.); Yin (1994) Case Study Research; Design and Methods (2nd Ed.).

Optional courses offered by the Department of Physics:

3312030 Applied Electronics (8 ECTS)

Objectives: The student understands mathematical and experimental analysis of analogue and digital circuits including diode, transistor, operational amplifier, oscillator DAC/ADC, and filtering circuits with noise utilizing the basis of electric impedance spectroscopy (EIS).
Content: The course provides an advanced sight into mathematical and experimental analysis of analogue and digital circuits with noise including diode, transistor, operational amplifier, oscillator DAC/ADC, and filtering circuits. Also a short introduction to electric impedance spectroscopy (EIS) with experiments will be given in introductory part of the course.
Modes of study: Written exam
*Evaluation criteria: S*cale 0 - 5.
Teaching methods: Lectures 48 hours and 24 hours of problem solving.
Study materials: Horowitz and Hill: The Art of Electronics, Benedict: Electronics for Scientists and Engineers, Storey: Electronics, A System Approach.
Teachers: Raimo Silvennoinen
Prerequisites: Recommended background knowledge: Basic Electronics
Time: Autumn semester 2011
Offering data: Lectured every year.
Further information: The course will be lectured in periods 1 and 2

3312021 Material Physics I (4 ETCS)

Objectives: To learn the principles of solid state physics and to understand the behaviour of solid state materials in different situations with simple models.
Content: Basics of crystal structure and x-ray diffraction. Crystal binding, phonons, free electron theory, and band theory. Thermal, electrical, and magnetic properties of solids.
Modes of study: Written exam
Evaluation criteria: Scale 0 - 5
Teaching methods: Lectures 24 hours, demonstrations 12 hours.
Study materials: C. Kittel: Introduction to Solid State Physics, H.P. Myers: Introductory Solid State Physics, Lecture notes.
Teachers: Toni Saastamoinen
Time: Autumn semester 2011

3312008 Physical Optics I (4 ECTS)

Objectives: To understand electromagnetic optic and wave optics. To understand polarization and coherence in wave optics and how different approximations are related to exact electromagnetic theory.
Content: Maxwell's equations, polarization, light at the interface, thin films, and basics of geometrical optics, coherence, interference and coherence.
Modes of study: Written exam
Evaluation criteria: Scale 0 - 5
Teaching methods: Lectures 24h and Exercises 12h
Study materials: Lecture notes; will be given in lectures
Teachers: Pasi Vahimaa
Prerequisites: Basics in optics and Photonics,
Time: *Autumn semester 2011*
Offering data: Every year
Key words: Optics, Maxwell's equations, polarization, coherence.