

# Master program in Computational Science

University of Oslo

Meeting December 4, 2017

## Agenda December 4, 2017, 12-2pm

1. **Welcome and minutes from last meeting. Coffee and light refreshments**
2. Approval of board members and external board members.
  - We may need to select stand-ins (vara-medlem in Norwegian) and one more student representative.
  - Board related practicalities and other guidelines
3. Discussion of courses
4. AOB, larger initiative on Computational Science

## Present board members and approval

1. Astrophysics: [Mats Carlsson](#)
2. Bioscience: [Tom Andersen](#)
3. Chemistry: [Michele Cascella](#)
4. Geoscience: TBD
5. IFI: [Andreas Austeng](#)
6. Math: [Karsten Trulsen](#)
7. Physics and head of program: [Morten Hjorth-Jensen](#)

8. Admin representative: [Espen Murtne](#), Physics
9. Student representative: [Oyvind Sigmundson Schoyen](#)
10. External representatives proposed (and they have agreed): [Alfred Hansen \(UiT\)](#) and [Ola Skavhaug](#)

## Practicalities to finalize

1. We need to select stand-ins (varamedlemmer). It is natural that each representative has her/his stand-in.
2. Norwegian texts almost done. The mn-fak admin will review our texts this week. As soon as they are done, we should carefully review them again.
3. The English texts are at <http://www.uio.no/english/studies/programmes/computational-science-master/index.html>

Feel free to review again the content of the website. The Norwegian website will be made public most likely towards the end of this week.

## Discussion of courses

An important aspect of this program is to be able to build a true interdisciplinary program. The easiest things to start with are our present courses and whether they can live up to our scientific and educational needs.

- Compulsory courses
  1. [FYS-MAT3155/4155 Data analysis and Machine learning with numerical projects](#), Fall semester?
  2. [MAT-IN3110 Introduction to numerical analysis](#), Fall semester?
  3. [IN3XXX/4XXX High-performance computing with numerical projects](#), slides from Xing Cai's talk last time are included with this mail. Spring semester?

Knut gave a summary of MAT-IN3110 last time. This course may need revisions in order to fit properly our needs.

## Discussion of courses: Courses of broad interest for several study directions

- Computational methods

1. [INF3331/4331](#) Problem solving with high-level languages (Python), fall semester
  2. [INF3380](#) Parallel computing for problems in the Natural Sciences (mostly PDEs), spring semester
- Linear Algebra, Spline, Optimization and Partial Differential equations
    1. [MAT4170](#) Spline methods
    2. [MAT-INF4110](#) Mathematical Optimization
    3. [INF-MAT4130](#) Numerical linear algebra
    4. [MAT-INF4300](#), PDEs and Sobolev spaces I
    5. [MAT-INF4310](#), PDEs and Sobolev spaces II
    6. [MAT-INF3360](#) - Introduction to Partial Differential Equations
    7. [INF5620](#) Numerical methods for PDEs, finite element method
    8. [INF5670](#) Numerical methods for Navier-Stokes equations

### **Discussion of courses: Machine learning**

1. [FYS-MAT3155/4155](#) Data analysis and Machine learning with numerical projects
2. [STK4030](#) Statistical Learning: Advanced Regression and Classification
3. [INF3490/4490](#) Biologically inspired computing
4. [INF5860](#) Machine Learning for Image Analysis

### **Discussion of courses: Bioinformatics and Bioscience**

1. [INF3490/4490](#) Biologically inspired computing, fall
2. [INF4350](#) Introductory Course in Bioinformatics, spring
3. [INF-BIO5121](#) High Throughput Sequencing technologies and bioinformatics analysis
4. [INF5380](#) High-performance computing in bioinformatics
5. [INF5560](#) Computational Physiology, fall
6. [MBV-INF4410](#) Bioinformatics for Molecular Biology, fall

## Discussion of courses: Computational Astrophysics, Chemistry and Physics

1. [AST5210](#) Stellar Atmospheres I, spring semester
2. [FYS3150/4150](#) Computational physics I, fall semester
3. [FYS4411](#) Computational physics II (Parallelization (MPI), object orientation, quantum mechanical systems with many interacting particles), spring semester
4. [FYS4460](#) Computational physics III (Parallelization (MPI), object orientation, classical statistical physics, simulation of phase transitions, spring semester
5. KJM4XXX Computational Molecular dynamics in life science and materials science
6. KJM4XXX Advanced course in Electronic structure

## Discussion of courses: Geoscience

1. GEO4310 - Stochastic methods in hydrology
2. GEO4450 - Geophysical Fluid Dynamics
3. GEO5440 Cryosphere modeling
4. GEF4530 - The General Circulation of the Atmosphere
5. GEF4600 - Methods in physical oceanography
6. GEO4131 - Geomechanics
7. GEO4620 - Seismic waves and seismology
8. GEO4630 - Geodynamics
9. GEO4520 - Advanced remote sensing and topographic analysis
10. GEO4320 - Hydrological modelling

### **Discussion of courses: Imaging and Biomedical computing**

1. INF4300 - Digital image analysis
2. INF4470 - Digital signal processing
3. INF4480 - Digital signal processing II
4. IN4010 - Acoustic Imaging
5. IN5450 - Array signal processing

### **Discussion of courses: Mechanics**

1. MEK4300 - Viscous Flow and Turbulence
2. MEK4350 - Stochastic and Nonlinear Ocean Waves
3. MEK4100 - Mathematical Methods in Mechanics
4. MEK4450 - Offshore Technology
5. MEK4570 - Computational Solid Mechanics
6. INF4331 - Problem solving with high level languages
7. MEK4250 - Finite Element Methods in Computational Mechanics
8. MEK4320 - Hydrodynamic Wave Theory
9. MEK4420 - Marine Hydrodynamics
10. MEK4470 - Computational Fluid Mechanics
11. MEK4600 - Experimental Methods in Fluid Mechanics
12. UNIK4660 - Visualization of scientific data
13. UNIK4900 - Advanced Turbulence Modeling and Simulations

## AOB: Discussion of larger initiative on Computational Science at UiO

- I would like to propose that we try to establish a new initiative at UiO called **Computing across the Disciplines**
  1. Can be established as a center
  2. It could coordinate education and research initiatives across disciplines.  
Our program fits excellently here
  3. It can have strong ties with the recently established center of excellence on computing in science education
  4. Unleash new research funds for computational science research

More material will be presented during the meeting, if time allows.