

# Syllabus and Information - Mock Exam I

## IPSP Freshman Tutorial WS2018/19

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### SYLLABUS

## 1 Theoretical Physics I - Mathematical Methods for Physics

- Vector algebra.
  - Dot Product, Cross product with the index notation..
  - Index manipulation with Kroneker delta and Levi-civita tensor.
- Matrix algebra.
  - Matrix addition, subtraction, multiplication.
- Vector Calculus.
  - Fields and operations on fields using the nabla operator.
    - Gradient.
    - Divergence.
    - Curl.
  - and their physical interpretation.
- Jacobians and coordinate systems.
  - Polar coordinates.
  - Spherical coordinates.
  - Cylindrical coordinates.

## 2 Mathematics I - Calculus of Single Variable

- Proof by induction.
- Basic Set theory.
- Infinite Sequences.
- Functions.

- Limits of Functions.

### **3 Experimental Physics I - Mechanics**

- Units and Dimensions
- Kinematics
  - 1D motion.
  - 2D and 3D motion.
- Dynamics
  - Force calculation using Newton's second law.
  - Free body diagrams

## INFORMATION

- Date : 20 November 2018, Time : 5:00, Location : KIHS.
- It will be a 120 minutes exam.
- Every section will be 40 minutes.
- You need to submit one section after every 40 minutes. This will be the order of the exam
  - 0 - 40 minutes - Theoretical Physics.
  - 40 - 80 minutes - Mathematics
  - 80 - 120 minutes - Experimental Physics.
- The exam starts at 5:15 but be there at 5, the question paper will be distributed 10 minutes prior and there will be some instruction.
- **Bring your own paper.** (A4 sized, ruled/checkered/plain)
- No formula sheet allowed. You can use a calculator for the Experimental Physics part.

## Hints to prepare.

### For TP

- Make sure you understand all the concepts properly.
- Practice computation of the above topics.
- Memorize the basic formulae from those topics.
- Understand all the diagrams we have covered till now in the seminar.

### For Math

- Memorize all the definitions.
- Remember the statements of the proofs. (You can use them without proving them.)
- Expect proofs.

### For EP

- Practise, Practise, Practise!
- Use solved problems from the books I suggested in the introductory seminar as a practise material.

### In General :

- Go over all your homeworks which are relevant to these topics and try to understand them.

*All the best for your preparation. The exam is meant to help you re-evaluate yourself so you understand what skills you lack. Don't be too hard on yourself preparing for it, try preparing in a relaxing environment. Use the hints I've given above. The exam will be easy if you know your concepts. (Memorizing stuff blindly won't help at all)*