Checklist for applicants to the programme "MSc Nanoscience" at the University of Kassel

This checklist is designed to help you in predicting whether you are eligible for the MSc Nanoscience programme. You may add this list to your application portfolio, but we need to check all prerequisites independently. The final decision is made by the examination committee after you have applied formally (for international applications via uni-assist.de). Please understand that we cannot guarantee any decision in advance.

Please note that you should have advanced knowledge in two natural sciences (Physics, Chemistry, Biology) and at least basic knowledge in the third one on tertiary education level.

A. Scientific requirements

Here is a topical list of subjects we expect you to be acquainted with from your previous bachelor studies. For your orientation, the number of credits that correspond to our Bachelor programme are given in the last column. 1 C correspond to an average workload of approximately 30 h. If your missing prerequisites add up to more than 30 credits, an application cannot be recommended. If your missing prerequisites add up to less than 30 credits, the Examination Committee may grant admission with additional requirements, i.e. you need to repeat and pass the missing subjects besides your regular studies. For this we now established Bridging the Gap modules which are self-study modules with tutorials and exams in English. The credits of these modules are also indicated. They are less than the full credits since they account only for upgrading to the necessary level (by averaging over all possible applicants).

I have **basic knowledge in three natural sciences:**
Note: 1 Credit (C) corresponds to an average workload of 30 hours, e.g. 15 hours class and 15 hours self-study

Chemistry:

General Chemistry (periodic table, chemical bond, acids and bases, redox reactions, stoichiometry, thermochemistry, electrochemistry, incl. exp. work) ☐ 7 C

Inorganic Chemistry (structures, properties and reactivity of inorganic compound classes and the related elements, chemistry of the most important elements, incl. exp. handling of dangerous materials) ☐ 10 C

Organic Chemistry (structures, properties and reactivity of organic compound classes, reaction mechanisms, lab safety, practical synthesis and isolation of organic compounds, characterization and record keeping) ☐ 10 C

Physical Chemistry (thermodynamics, reaction kinetics, incl. mathematical treatment e.g. partial derivatives and differential equations, electrochemistry, spectroscopy) ☐ 10 C

Corresponds to a Bridging the Gap module of 12 C (fundamentals).

Physics:

Mechanics and Heat (differential equations and conservation laws for mechanics of point masses, rigid bodies: moment of inertia and vector description of rotational dynamics, stress-strain relation in 3 dimensions, differential equations for vibrations with frictional and driving terms, statistical approach to thermodynamics, heat capacity, thermodynamic laws, Carnot cycle, real gases, phase transitions, black body radiation, key experiments and limits of classical physics) ☐ 9 C

Electricity and Optics (electrostatics, electrical field and potential, electromagnetic induction, magnetic fields, electrical circuits (direct and alternating current, description of LCR circuits with complex quantities), Maxwell's equations, electromagnetic waves, Hertz dipole, polarization of light, refraction, Fresnel's equations, coherence, interference, diffraction at different objects ☐ 9 C

Quantum mechanics (wave-particle duality, De-Broglie waves of matter, wave packet dynamics, superposition principle, Heisenberg's uncertainty relations, Schrödinger equation, simple rectangular potentials, tunnel effect, harmonic oscillator, one-electron systems, angular momentum operator, hydrogen atom, many body systems, identical particles, Pauli principle) ☐ 5 C

Corresponds to a Bridging the Gap module of 11 C (fundamentals).

Biology:

Genetics and biochemistry (nucleic acids, replication, transcription, translation, proteins, carbohydrates, lipids, enzyme reactions, energy requirements) ☐ 8 C

Biophysics (properties of membranes, folding and stability of proteins, principles of self-organization, reaction kinetics) ☐ 5 C

Corresponds to a Bridging the Gap module of 6 C (fundamentals).

In addition, I have **advanced knowledge** and **practical skills** in at least **one of three disciplines**

Chemistry:

Synthetic chemistry (metal-catalyzed reactions, C-C- and C-heteroatom bond formation, practical performance of chemical syntheses) or other chemical subdispline(s) ☐ 12 C

Corresponds to a Bridging the Gap module of 6 C (specialization).

Physics:

Solid state physics, atomic and molecular physics, or other physical subdiscipline(s) ☐ 12 C

Corresponds to a Bridging the Gap module of 6 C (specialization).

Biology:

Additional biological subdisciplines: e.g. cell biology, microbiology, (neuro)physiology, with practical experience in the most important molecular biological methods ☐ 12 C

Corresponds to a Bridging the Gap module of 9 C (specialization).

B. Language requirements

We require English level B2 which can be obtained in one of the following ways:

a) 5 years of English at school until the final exam which allows entry into university (the final exam or the English courses of the last two years have to be passed) ☐

or b) one year of studies at higher education (e.g. university) in which the primary language was English ☐

or c) one of the following certificates:

TOEFL certificate, Internet-based with Total 72-94 or more ☐

TOEIC certificate, 400-485 (listening), 385-400 (reading) or more ☐

IELTS min. band score 5.5-6.5 ☐

Telc English certificate B2 or B2 School, Business, Technics ☐

Cambridge English Language Assessment B2 First (FCE), BEC Vantage ☐

College English Test (CET) certificate Band -6 or more ☐

Pearson PTE Academic 75-59 Punkte ☐

Unicert II B2, ALTE Level 3 or equivalent certificate ☐

Further information can be found on the university's website.

German is not necessary for the modules in the Master curriculum, however for daily life, student jobs etc., it is useful to have a basic command of the language.