Anhang 2 zur „Satzung über das Studium an der TUHH“ in der Fassung vom 28. Oktober / 25. November 2015 (Amtlicher Anzeiger Nr. 5 vom 19. Januar 2016)

Fachspezifische Anforderungen für den Master-Studiengang Chemical and Bioprocess Engineering (2 Seiten)

Specific Requirements for the International Master Program “Chemical & Bioprocess Engineering”

Applicants should hold a Bachelor's or equivalent degree in Chemical Engineering or Biotechnology. The ideal candidate should have a solid education in the foundations of these disciplines. For orientation, core courses and topics taught in the corresponding Bachelor Programs at TUHH are given in the table below.

Field	Requirements	CP
Math	**Analysis** (e.g. Functions, Sequences and Series, Taylor Series, Calculus, Error Analysis, Power Series, Integration, Periodic Functions, Fourier Series, Multi-Variable Calculus, Mean Value Theorems, Taylor’s Theorem, Maximum and Minimum Values, Implicit Functions, Newton’s Method, Double-, Line- and Surface Integrals)	12
	Linear Algebra (e.g. Vectors and Vector Calculus, Vector Spaces, Systems of Linear Equations, Linear Mappings, Linear Regression, Eigenvectors and Eigenvalues, System of Linear Differential Equations)	8
	Differential Equations (e.g. Initial Value Problems, Boundary Value Problems, Eigenvalue Problems, Numerical Methods for Initial and Boundary Value Problems, Partial Differential	4
	Total	**24**
Chemistry & Physics	**General and Inorganic Chemistry** (e.g. Molecular Orbital Theory, Interactions in Gas-, Liquid and Solid Phase, Chemical Equilibrium, Acid-Base Reactions, pH Calculations, Redox Reactions, Nernst Equation)	3
	Organic Chemistry (e.g. Saturated and Unsaturated Hydrocarbons, Aromatic Compounds, Alcohols and Phenols, Ethers, Aldehydes, Ketones, Carboxylic Acids, Esters, Amines, Amides, Amino Acids, Organic Reactions like Substitutions,	3
	Physical Chemistry (e.g. State Variables and State Equations, Laws of Thermodynamics, Phase Equilibria, Chemical Equilibria, Equilibria at Surfaces and Interfaces, Chemical Kinetics,	3
	Physics (e.g. One- and Multidimensional Kinematics, Dynamics, Gravitation, Work and Energy, Momentum, Rotational Motion, Conservation Laws, Oscillatory Motion)	3
	Total	**12**

Thermo-dynamics	**Technical Thermodynamics** (e.g. Thermal Equilibrium and Temperature, Heat and Work, First Law for Closed and Open Systems, Changes of State, Carnot Process, Entropy, Exergy, Fundamental Equations of Thermodynamics, Thermodynamic Potentials, Caloric State Variables and Equations, Gas-Vapor Mixtures, Cycle Processes, Combustion Processes)	6
	Multi-Phase, Multi-Component Thermodynamics (e.g. Thermodynamics of Mixtures, Chemical Potential, Fugacity, Phase Equilibria, Vapor Pressure, Gibb's Phase Rule, Virial Equations, van- der-Waals Equation, Mixing Properties, G^E-Models, Vapor-Liquid Equilibria, Gas-Liquid Equilibria, Solid-Liquid Equlibria, Liquid-Liquid Equilibria)	3
	Total	**9**
Fundamen-tals of Chemical Engineering	**Fundamentals of Fluid Mechanics** (e.g. Fluid Properties, Hydrostatics, Theory of Streamline, Conservation Equations, Navier Stokes Equations, Irrotational Flows, Flow around Bodies, Turbulent Flow, Compressible Flow)	3
	Heat and Mass Transfer (e.g. Heat Conduction, Convective Heat Transfer, Non-Steady Heat Conduction, Thermal Radiation, Diffusion, Boundary Layer Theory, Non-Steady Mass Transfer, Heat and Mass Transfer on Single Particles and in Fixed Beds, Mass Transfer and Chemical Reactions)	3
	Thermal Separation Processes (e.g. Distillation, Extractive and Azeotropic Distillation, Water Vapor Distillation, Extraction, Drying, Chromatographic Separation, Membrane Separation, Energy Demand of Separation Processes)	3
	Chemical Reaction Engineering (e.g. Fundamentals of Stoichiometry, Chemical Thermodynamics and Reaction Kinetics, Mole Balance, Isothermal Ideal Reactors, Batch Reactor, Semi- Batch Reactor, Continuously Stirred Tank Reactor, Plug Flow Reactor, Heat Balance, Non-Isothermal Ideal Reactors, Stability Behaviour of Wall-Cooled CSTR's,	3
	Process and Plant Engineering (e.g. Structure and Operation of Production Plants, Technical Process Design, Motivation and Targets of Process Development, Life Cycle of Production Plants, Mass and Energy Balances, Graphical Representation of Processes, Multidimensional Regression, Process Synthesis, Process Safety, Cost Estimation)	3
	Total	**15**
Fundamen-tals of Bioprocess Engineering	**Fundamentals of Bioprocess Engineering** (e.g. Enzyme Kinetics, Stoichiometry, Microbial Growth Kinetics, Kinetics of Substrate Consumption and Product Formation, Rheology, Transport Processes in Bioreactors, Technology of Sterilization, Bioprocess Management, Downstream Technology in	3
	Biochemistry and Molecular Biology (e.g. Amino Acids, Peptides, Proteins, Carbohydrates, Lipids, Protein Functions, Enzymes, Cofactors, Cosubstrates, Vitamines, Metabolism, Procaryotic Cell, Microorganisms)	3
	Total	**6**
SUM		**66**