Biochemical engineering - chemical engineering interfacing with the life sciences, including:

- the application of modern tools such as protein and enzyme engineering in biochemical engineering;
- systems biology;
- the use of biology to effect a transformation of material;
- waste treatment;
- bio-reaction engineering;
- high-throughput process development;
- simulation of molecular and process performance;
- downstream processing;
- bioreactor modeling.

Materials synthesis and processing

- Chemical engineering of materials synthesis, characterization, design, control, and scale up of materials synthesis
- Reverse materials engineering (i.e. process-informed definition of materials properties)
- Materials screening and selection
- Materials including particles/nanoparticles, thin films, membranes, multifunctional materials, hierarchical porous structures
- Synthesis methods include chemical vapor deposition, atomic layer deposition, hydrothermal synthesis, colloidal synthesis, self- and directed assembly, among others
- Synthesis-structure-function relationships of materials or material classes
- Nucleation and growth (or formation) mechanisms of materials

Particle technology

Chemical engineering process steps to manipulate the properties of particles and particulate systems:

- Flow measurement and tomography of particulate processes;
- Fluidization and fluid-particle systems;
- Novel particle synthesis, surface functionalization, production, and characterization;
- Modeling and simulation for fluid dynamics of particulate systems in chemical processes;
- Nucleation, growth, breakage and aggregation, particle population dynamics.

Process systems engineering

- Simulation, analysis, synthesis, optimization, and control of (bio-)chemical process systems based on mathematical modeling approaches;
- Advanced modeling strategies for all levels of the process systems hierarchy (molecular level, phase level, process unit level, plant level; enterprise level);
- Advanced methods for model and parameter identification;
- Methods for the design of experiments in chemical engineering.

Reaction engineering and catalysis
Simulation and experiments on

- reaction kinetics;
- catalyst synthesis, characterization and application;
- reactor design;
- process reaction intensification;
- multifunctional, micro- and multiphase reactors;
- molecular and quantum scale phenomena;
- density functional theory;
- multiscale modeling;
- transport phenomena related to multiphase reactors.

Separation Processes

- general principles: phase equilibria, mass transfer, mixing and phase segregation;
- processes and unit operations: distillation, absorption, liquid-liquid extraction, membrane processes, adsorption separation processes, ion-exchange, preparative chromatography, crystallization and precipitation;
- supercritical fluid separation processes;
- biochemical separation processes;
- equipment design.

Thermodynamics and Soft Matter
Fundamental studies in thermodynamics and physical chemistry that have ultimate application in chemical engineering, including:

- equations of state, chemical potential, diffusion, fugacities;
- phase diagrams and the estimation of partial excess properties;
- emulsions, foams and the behavior of surfaces including fluid-fluid interfaces;
- colloidal and self-assembled systems;
- studies purely based on observation or reporting data that do not provide fundamental insight are discouraged; studies that bring fundamental understanding through modern analysis through molecular simulation are encouraged.

Transport Phenomena, including Fluid Mechanics
Core chemical engineering papers concerning transport and rate processes in physical, chemical and biological systems including fundamental insights obtained through the use of computational fluid dynamics preferably validated experimentally.