This course will start from the basic units of life and their biological activities in multiple scales, and take the activities of life substances in different scales as the

	main line to explore the ways to achieve biological functionality in molecular, nano-, micro- and even macro- scales. The course will cover the concepts, models and methods related to biological functional materials, and introduce the application of biological functional materials in disease diagnosis, drug delivery and modern industry. The course will combine the basic principles of biological functional materials and the cutting-edge progress in related fields, so that students can not only understand the design concept, preparation method, characterizations and cutting-edge applications of biological functional materials, but also have the ability to design materials, regulate their functionality and realize their biological activities according to the application requirements in related fields. This course will cultivate the knowledge and ability in the design, preparation and performance evaluation of advanced biological functional materials.

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	This course belongs to the interdisciplinary frontier between materials science, biology, and chemistry, , and it is also one of the hot topics related to materials. The course has 32 class hours. It focuses on the core topics of realizing the biological function and biological activity of materials in multi-scales. While explaining the basic concepts, it emphasizes the influence of the performance of materials from nano to micro, and even macro scales on their biological functions, and focuses on the application of advanced biological functional materials in disease diagnosis, treatment and modern industry. The course content mainly includes the following 8 parts: 1. Introduction to advanced biological functional materials (2 class hours) 1.1 Development history of biological functional materials (1 class hour) 1.2 The trend of development of biological functional materials (1 class hour) 2. Natural biological functional materials (4 class hours) 2.1 Small molecular natural biomaterials (1 class hour) 2.2 Macromolecular natural biomaterials (1 class hour) 2.3 Ceramic materials from organisms (2 class hours) 3. Biological nano-materials (6 class hours) 3.1 Design of biological nano-materials (1 class hour) 3.2 Preparation of biological nano-materials (1 class hour) 3.3 Application of biological nano-materials (2 class hours) 3.4 Experiment: Preparation of virus-like nano-carrier (2 class hours) 4. Cell-like functional materials (4 class hours) 4.1 Design concept of cell-like functional materials (1 class hour) 4.2 Preparation and characterization of cell-like functional materials (1 class hour) 4.3 Experiment: preparation experiment of artificial cell-like microcapsules (2 class hours) 5. Bioactive ceramics and its application (4 class hours) 5.1 Preparation and characterization of bioactive ceramics (1 class hour)

	5.2 Application of bioactive ceramics (1 class hour) 5.3 Experiment: Bioceramic preparation (2 class hours) 6. Advanced biological functional materials and disease diagnosis (4 class hours) 6.1 Multi-functionality of advanced biomaterials (2 class hours) 6.2 Application of advanced biological functional materials in disease diagnosis (2 class hours) 7. Advanced biological functional materials and drug delivery (4 class hours) 7.1 Drug delivery and controlled release (2 class hours) 7.2 Application of advanced biological functional materials in drug delivery (2 class hours) 8. Advanced biological functional materials and modern industry (4 class hours) 8.1 application of biological functional materials in marine engineering (2 class hours) 8.2 application of biological functional materials in environmental engineering (2 class hours)
	“ ” “ ” 100% = 10% + 30% + 40% + 20%
	The course will adopt the concept of "expanding basic theory and knowledge around the frontier research of biological functional materials", and combine classroom teaching with experiment and practice. In the application of materials, "case teaching" method is adopted. Each core content includes 1-2 cutting-edge application examples. Combined with the typical cases of cutting-edge research, students can understand and apply the basic knowledge to cutting-edge practice from the cases related to national economy and people's livelihood, so as to deepen the understanding and mastery of knowledge in practical application, and cultivate the capability of designing biological function of materials for their real applications. The teaching methods will include teaching in classroom, experiments, course project, course thesis, course speech, . The course assessment will use a combination of course speech, teacher-student communication, experiments, and course thesis to comprehensively evaluate students' capabilities.

	Final score (100%) = class discussion (10%) + experiments (30%) + course thesis writing (40%) + course thesis speech (20%)
	Zhao Qin, Leon Dimas, David Adler, Graham Bratzel and Markus J Buehler, Biological materials by design, J. Phys.: Condens. Matter 26 (2014) 073101 (13pp)
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