课程大纲
COURSE SYLLABUS

1.	**课程代码/名称** **Course Code/Title**	**神经工程与智能传感/Neural engineering and smart sensor**
2.	**课程性质** **Compulsory/Elective**	专业选修课 Major Elective Courses
3.	**课程学分/学时** **Course Credit/Hours**	3 学分/48 学时 3 Course Credit/48 hours
4.	**授课语言** **Teaching Language**	英语 English
5.	**授课教师** **Instructor(s)**	肖凯 Kai Xiao
6.	**是否面向本科生开放** **Open to undergraduates or not**	否 No
7.	**先修要求** **Pre-requisites**	无/NA

8. 教学目标
Course Objectives

神经工程是了解并操控神经系统的多学科交叉研究，而智能传感是了解神经系统自身生理信息、疾病发生发展系统及神经调控机制的必要支撑手段。本课程通过全面讲授快速发展的神经工程与智能传感的基础知识和最新发展，使刚刚进入或准备进入这一领域的研究生系统地了解这一涉及生物、化学、材料、工程、器件多学科交叉领域，使他们可以在多学科交叉差的科研环境中有效地交流。

Neural engineering is a multidisciplinary research topic to understand and control the nervous system, and smart sensor is a necessary support means to understand the physiological information of the nervous system itself, the disease development system and the neural regulation mechanism. This course comprehensively teaches the basic knowledge and the latest development of the rapidly developing neural engineering and smart sensors. To offer a truly inter-disciplinary course at the frontier of biology, chemical, materials, engineering, and devices, which will allow them to communicate efficiently in an ever-increasing multidisciplinary research environment.

9. 教学方法
Teaching Methods

讲授与讨论结合，理论与实例结合，PPT 与黑板授课结合
The combination of lecture and discussion, theory and living examples, PPT and blackboard

10. 教学内容
Course Contents
（如面向本科生开放，请注明区分内容。 If the course is open to undergraduates, please indicate the difference.）

Section 1	**General introduction to neural engineering (神经工程概述，2 学时)**
Section 2	**Fundamentals of human neural system (人体神经工程概要，2 学时)**
Section 3	**Sensing technologies of neural system (神经系统传感技术，2 学时)**
Section 4	**Neural regulation technologies (神经系统调控技术，2 学时)**
Section 5	**Introduction to brain-computer interface (BCI) (脑机接口简介，2 学时)**
Section 6	**BCI electrodes and electroencephalogram collection. (脑机接口电极及信号采集，2 学时)**
Section 7	**Introduce the classical applications of BCI. (脑机接口实践及应用，2 学**

	时)
Section 8	**Introduction to neuromorphic devices (神经拟态器件简介，2 学时)**
Section 9	**Mechanism, classification, and applications of neuromorphic devices (神经拟态器件的机理、分类及应用，6 学时)**
Section 10	**Neuromorphic devices and Neuromorphic computing (神经拟态器件及神经拓扑计算，2 学时)**
Section 11	**Frontiers in Neuromorphic devices (神经拟态器件前沿进展，2 学时)**
Section 12	**Introduction to smart sensor (智能传感简介，2 学时)**
Section 13	**Classical biomedical sensing technology (经典生物医学传感技术，2 学时)**
Section 14	**Biomolecules sensor (生物分子传感器，2 学时)**
Section 15	**Biological chip (生物芯片，2 学时)**
Section 16	**Biomimetic sensor (仿生传感器，2 学时)**
Section 17	**MEMS smart sensor (微机电系统智能传感，2 学时)**
Section 18	**Wearable smart sensor (可穿戴智能传感，2 学时)**
Section 19	**The application of smart sensor in neural engineering (神经工程中智能传感的应用，2 学时)**
Section 20	**Final presentation (期末文献汇报，6 学时)**

11. 课程考核
Course Assessment

（①考核形式 Form of examination；②.分数构成 grading policy；③如面向本科生开放，请注明区分内容。If the course is open to undergraduates, please indicate the difference.）

出勤 Attendance 30%，期末文献汇报 Final Presentation 70%

12. 教材及其它参考资料
Textbook and Supplementary Readings

1. Principles of Neural Science, Kandel
2. Brain-computer interfaces: Revolutionizing human-computer interaction, by Graimann, B., Allison, B. Z., & Pfurtscheller, G.
3. Neural Engineering, He
4. Neuromorphic Devices for Brain-inspired Computing: Artificial Intelligence, Perception, and Robotics, Wan