**《嵌入式计算机系统及实验》课程教学大纲（2020版）**

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| 课程基本信息（Course Information） | | | | | | | | |
| 课程代码（Course Code） | BI252 | | | \*学时（Credit Hours） | 48 | | \*学分（Credits） | 3 |
| \*课程名称（Course Name） | （中文）嵌入式计算机系统以及实验 | | | | | | | |
| （英文）Embedded Computer System and Experiment | | | | | | | |
| 课程类型 (Course Type) | 专业选修课 | | | | | | | |
| 授课对象（Target Audience） | 生物医学工程专业本科二年级、三年级学生 | | | | | | | |
| 授课语言 (Language of Instruction) | 全中文 | | | | | | | |
| \*开课院系（School） | 生物医学工程学院 | | | | | | | |
| 先修课程（Prerequisite） | 数字电路，C语言 | | | 后续课程 (post） |  | | | |
| \*课程负责人（Instructor） | 牛金海 | | | 课程网址 (Course Webpage) |  | | | |
| \*课程简介（中文）（Description） | （中文300-500字，含课程性质、主要教学内容、课程教学目标等）  嵌入式计算机系统是一门结合模拟电路、数字电路与C++程序设计的学科。本课程主要介绍嵌入式系统及其在医疗仪器中的应用，MSC51的基本原理与指令系统，Keil51与proteus的使用，IO和其他外设的接口和扩展技术，MSP430的基本原理与指令系统，IAR/CCS的使用，以及32微嵌入式微处理器ARM。通过学习本课程，学生能够具备利用proteus设计原理图和仿真的能力，MCS-51的程序设计能力，同时具备MSP430的程序设计和在线仿真的能力。  通过本课程学习，学生将掌握嵌入式处理器的工作原理，并能根据实际需求开发设计基于嵌入式技术的科学实验平台或者新型医疗仪器，具备将嵌入式技术应用到生物医学工程领域的能力。 | | | | | | | |
| \*课程简介（英文）（Description） | （英文300-500字）  The embedded computer system is a subject that is combined with analog circuit, digital circuit and C++ programing. In this class, basic knowledge of embedded systems and its applications in medical instrument will be introduced. In addition, knowledge of principles and instruction system of MSC-51 and the use of Keil51 and proteus will also be taught. In the second half semester, students will be introduced of the knowledge of principles and instruction system of MSP 430. At the same time, the assorted software, IAR/CCS, is also the course content. At the end of the class, the basic knowledge of 32-bit embedded system, ARM, will be introduced. By this class, students can get the ability to program with ASM and C language on embedded system platform and use simulating software Proteus to design schematic diagram and simulate on PC. Besides, they can also design software programs and debug issue in program independently and a simple Biomedical system based on embedded system. | | | | | | | |
| 课程目标与内容（Course objectives and contents） | | | | | | | | |
| \*课程目标 (Course Object) | LO1. To have knowledge of the principles and applications of Embedded System（MSC-51 8bit, MSP430 16bit and ARM 32bit）（A3，B2，C5，D1）  LO2. To develop the students’ abilities to Program and debug embedded software programs independently with C and ASM language（A3，B2，C2，D1）  LO3.To develop the students’ abilities to design hardware system with Embedded system technology and have ability to debug issue in it independently（A4，B2，C5，D2）  LO4. To learn basic flow of designing a biomedical system based on embedded technique and can complete a design case in a team（A5，B2，C2，D2）  Student Outcome 2  Performance Indicator 2-2will be addressed by LO1, LO2, LO3;  Student Outcome 5  Performance Indicator 5-1will be addressed by LO3 and LO4;  LO1 is assessed by in-class quizzes, homework and exam;  LO2 is assessed by homework and exam.  LO3is assessed by experiment and mini project;  LO4is assessed by experiment and mini project.  Notes:  SO2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors  SO5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives  上海交通大学本科人才培养目标：http://jwc.sjtu.edu.cn/web/sjtu/198052-1980000007282.htm | | | | | | | |
| 毕业要求指标点与课程目标的对应关系 | 课程目标 | | | | 毕业要求指标点 | | | |
| 课程目标1 | | | | 毕业要求1 | | | |
| 课程目标2 | | | | 毕业要求1，5 | | | |
|  | 课程目标3 | | | | 毕业要求1，2，3，5 | | | |
|  | 课程目标4 | | | | 毕业要求1，2，3，4，5，11 | | | |
| \*教学内容进度安排及对应课程目标 (Class Schedule & Requirements & Course Objectives) | 章节 | 教学内容（要点） | 教学目标 | 学时 | 教学形式 | 作业及考核要求 | 课程思政融入点 | 对应课程目标 |
| 1、绪论 | 课程介绍，嵌入式计算机系统介绍 | 了解本课程的教学体系，生物医学工程应用 | 10 | 课堂教学 | C语言学习，详见word文本 | 培养刻苦努力的学习精神 | LO1 |
| 2、msp430原理 | mcu ，寄存器，memory，定时器，UART | 掌握430处理器的原理以及接口技术，C语言编程 | 8 | 课堂教学 | 实验箱学习，详见word文本 | 培养刻苦努力的学习精神 | LO2. |
| 3、MSP430实验 | IO，定时器，音频等外设 | 掌握430接口技术 | 6 | 实验课 | 流水灯编程详见word文本 | 培养刻苦努力的学习精神 | LO2 |
| 4 MCS51 原理 | MCU，Memory，寄存器，IO外设等 | 掌握51单片机的原理 | 10 | 课堂 | 编程，问答详见word文本 | 培养刻苦努力的学习精神 | LO2，LO3 |
| 5、MCS51实验 | 定时器串口通信等 | 掌握51单片机的外设接口技术 | 8 | 实验课 | 编程，详见word文本 | 培养刻苦努力的学习精神 | LO4，LO3 |
| 6、综合大作业 | 综合应用嵌入式技术 | 设计两个完整的系统 | 6 | 实验课 | 编程，详见word文本 | 培养刻苦努力的学习精神 | LO3，LO4 |
| 注1：建议按照教学周周学时编排，以便自动生成教学日历。  注2：相应章节的课程思政融入点根据实际情况填写。 | | | | | | | |
| 课程目标达成度评价 | 课程目标  考核方式 | | | 平时作业(20分) | 课程项目 (30分) | 期末考试（50分） | 课程目标权重 | 课程目标达成度 |
| 见附表 | | |  |  |  |  |  |
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| \*考核方式 (Grading) | 示例：  （1）平时作业 20分  （2）课程项目 30分  （3）期末考试 50分 | | | | | | | |
| \*教材或参考资料 (Textbooks & Other Materials) | 参考资料：  1、8051单片机基础教程，陈明荧，科学出版社，2003  2、MSP430系列16位超低功耗单片机原理与实践，沈建华杨艳琴，北京航空航天大学出版，2008  3、MSP430系列16位超低功耗单片机原理与应用，沈建华杨艳琴翟晓曙，清华大学出版社，2004  4、MSP430系列16位超低功耗单片机实践与系统设计，沈建华杨艳琴翟晓曙，清华大学出版社，2005  5、Instruments T. MSP430x4xx Family User’s Guide(Rev. J)[J]. 2004. | | | | | | | |
| 其它（More） |  | | | | | | | |
| 备注（Notes） |  | | | | | | | |
| 备注说明：  1．带\*内容为必填项。  2．课程简介字数为300-500字；课程大纲以表述清楚教学安排为宜，字数不限。 | | | | | | | | |

附表：课程目标达成度评价

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| **Summary of the Attainment of LOs** | | | | | |
| Learning Outcomes     Assignments Weight | | LO1 | LO2 | LO3 | LO4 |
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| Homeworks | 30% | 100.0% | 100.0% | 100.0% | 100.0% |
| Lab and Report | 20% | 100.0% | 100.0% | 100.0% | 100.0% |
| Attendance & class participation |  |  |  |  |  |
| Final Exam | 50% | 56.3% | 56.3% | 56.3% | 56.3% |
| Total | 100% |  |  |  |  |
| Weighted averages | | 78.1% | 78.1% | 78.1% | 78.1% |