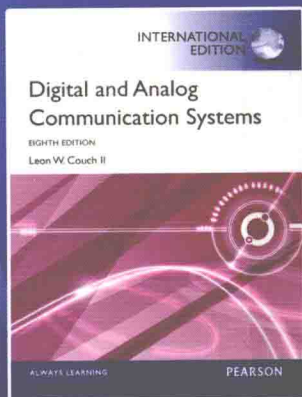


国外电子与通信教材系列

英文版

PEARSON

数字与模拟通信系统 (第八版)



Digital and Analog
Communication Systems

Edition

[美] Leon W. Couch, II 著



电子工业出版社
PUBLISHING HOUSE OF ELECTRONICS INDUSTRY

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Publishing House of Electronics Industry

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内 容 简 介

本书在前七版的基础上进行了修订与更新,系统介绍了现代通信系统的基本理论和最新发展技术。全书共分8章,内容包括:通信系统的基本概念;信号与频谱;基带脉冲与数字信号;带通信号传输原理与电路;调幅、调频及数字调制系统;随机过程与频谱分析;噪声背景下通信系统的性能;有线及无线通信系统。每章都有一定的助学例题及大量的习题,部分例题及习题另配有MATLAB文件。此外,本书还包含3个附录:数学基本公式及图表;概率论及随机变量的简易教程;MATLAB入门。此次新版中更新了所有MATLAB文件,新增了100多道例题并给出了更多的习题答案。此外,本书还给出了数字电视(DTV)技术、长期演进(LTE)系统、WiMAX 4G蜂窝系统、个人通信系统及其应用等内容的介绍。

本书适合作为高等院校电子通信等相关专业的高年级本科生或研究生的入门课程教材,也可作为通信工程技术人员和科研人员的参考书。

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前 言

本书继承了第一版~第七版的写作风格,在此新版中为读者介绍了数字通信系统的最新技术发展成果。本书不仅可供工科二、三年级的本科生使用,也适合作为研究生的入门课程教材,或作为电气工程师的最新技术参考书。与本书配套的还有包含100多道精选的课外习题详细解题过程的学生题解手册,以及需借助计算机求解的课外习题的MATLAB文件,都可在 www.pearsonhighered.com/couch 中下载得到^①。

此次新版中的一个最大变化是全书新增加了100多道例题。学生们总是希望书中可以有更多的例题。大部分新增加的例题给出了问题描述,相关的MATLAB文件(可从以上网址下载得到)包含了新增加的例题的解题过程、计算步骤及绘图结果。这样做有以下好处:首先,对每个例题的问题描述只用几行文字,因此全书不会增加太多的篇幅;其次,学生学习了使用MATLAB编程解题的方法。还有就是得到了比用手工方法计算更清晰的绘图结果,同时学生还能发现MATLAB程序中的参数变化是如何影响计算结果的。作者相信这种方法是一种教学手段上的创新。

如果要学习通信系统,首先必须搞清楚通信系统是如何工作的。读者在掌握本书前5章介绍的通信系统基本知识(信号功率、频谱及信号的傅里叶分析等)的基础上,再通过对比书中大量的助学例题和课外习题的练习,以及对采用的通信标准的应用,将能更好地理解通信系统的工作原理。特别值得关注的是有线及无线通信系统。另外,噪声对通信系统的影响也是很重要的。如果通信系统中没有噪声(噪声由概率论及随机过程来描述),那么用极小的发射功率就可以把信号传至无穷远。总之,本书包括了学习有线及无线通信系统所需的基本内容和通信系统中采用的技术标准,具体内容有

- 通信系统的工作原理:第1章~第5章;
- 噪声对通信系统的影响:第6章及第7章;
- 有线和无线通信系统:第8章。

本书既可作为一学期课程的教材使用,也可作为两学期课程的教材使用。本书着重阐述了能在一学期课程内讲述的通信系统理论和应用的基本内容,也介绍了可在两学期课程时间内进行深入讨论的必要内容。这里“着重”的意思是说,全书的篇幅必须限制在750页左右。其实更大的篇幅也不能包括新增加的内容,即便是用于两学期的课程。(目前许多学校都倾向于开

^① 相关资源也可登录华信教育资源网(www.hxedu.com.cn)注册下载。

设阐述基本通信理论的一学期课程。)本书介绍了编码、无线信号传播、WiMAX 及蜂窝系统的长期演进(LTE)等概念。这些概念的详细内容在专门的教材中将会讨论。

如果作为一学期课程的教材使用,建议将本书中的前5章作为讲授内容,可以介绍通信系统的基本工作原理(适当选择第8章的内容作为补充);倘若作为两学期课程的教材来使用,那么就将全书作为讲授内容。

本书涉及了通信系统中的一些实际应用问题,这些实际应用建立在通信系统坚实的理论基础之上。

通信系统的理论基础

- 数字信号与模拟信号
- 幅频特性和相频特性
- 傅里叶分析
- 正交函数理论
- 功率谱密度
- 线性系统
- 非线性系统
- 码间串扰
- 复包络
- 调制理论
- 概率论与随机过程
- 匹配滤波器
- SNR(信噪比)的计算
- BER(误比特率)的计算
- 最佳系统
- 分组码与卷积码

实际的应用

- PAM、PCM、DPCM、DM、PWM 及 PPM 等基带信号
- OOK、BPSK、QPSK、MPSK、MSK、OFDM 及 QAM 等带通数字信号
- AM、DSB-SC、SSB、VSB、PM 及 FM 等带通模拟信号
- 时分复用及其体系标准
- 数字线路传输码及其频谱
- 通信系统中所用的电路
- 比特同步、帧同步及载波同步电路
- 软件无线电
- 频分复用及其体系标准
- 电信系统
- 电话系统
- 数字用户环线调制解调器
- 数字用户环线
- 数字通信系统的误比特率
- 光纤系统
- 扩频系统
- AMPS、GSM、iDEN、TDMA 及 CDMA、WiMAX、LTE 蜂窝电话系统
- 数字与模拟电视系统
- AM、FM、TV、DTV 及 CATV 系统的技术标准
- 有线数据调制解调器
- Wi-Fi 及 WiMAX 无线数据网络
- Web 页面中的 MATLAB M 文件
- 数学图表
- 助学例题
- 超过 100 道带有求解过程的例题,其中大约 80 道例题带有 MATLAB M 文件

- 卫星通信系统
- 卫星无线广播系统
- 有效输入噪声温度与噪声系数
- 线路预算分析
- 模拟通信系统输出端的信噪比
- 超过 550 道的课外习题和部分答案
- 超过 60 道需借助计算机求解的课外习题
- 大量的参考文献
- 重视通信系统的设计
- 学生题解手册（可下载）

本书新版的改进之处：

- 增加了 100 多道带有解题过程的例题。大部分增加的例题有 MATLAB 解题程序文件，这些文件可以从作者的网站中下载得到。
- 增加了最新的无线通信系统、LTE 系统、WiMAX 4G 蜂窝系统、个人通信系统及其应用等内容的介绍。
- 增加了数字电视（DTV）技术的介绍。
- 列出了最新的专业术语及标准。
- 更新了所有章节的内容。
- 增加并修订了课外习题。
- 给出了通过设置合适的关键词，利用 Google 等因特网搜索引擎获取最新标准及其应用信息的建议。
- 继续强调利用 MATLAB 编程的方法来解决问题，这种利用计算机编程解决问题的方法，对于训练刚进入通信行业中的工程师非常重要。本书是为数不多的几本提供了 MATLAB 文件（可以从网上下载得到）的教材之一。这样做省去了读者自己输入教材中所列程序的时间。
- 更新了所有 MATLAB 文件，以便在 Version R2010b 版本中运行。
- 增加了书后部分习题答案的数量，并在适当的地方给出了习题的 MATLAB 解题程序文件。

本书在许多课外习题旁标有计算机的符号 ，表示这些课外习题有用 MATLAB 编写的仿真软件及答案。

书中每章的后面都有课外习题。大约有 1/3 的课外习题标有 ★，这些习题的完整解题过程可在学生题解手册中找到。学生题解手册可以通过以下的网址下载得到：www.pearsonhighered.com/couch^①，供学生使用的 M 文件也可以下载得到。教师题解手册中给出了包括计算机求解过程在内的全部课外习题答案^②。题解手册为 PDF 文件，对需借助计算机求解的课外习题，也给出了相应的 MATLAB M 文件。

① 相关资源也可登录华信教育资源网（www.hxedu.com.cn）注册下载。

② 教师题解手册和其他教辅资源（PPT 等）只提供给授课教师，申请方式请参见书末的“教学支持说明”。

本书是我在佛罗里达大学多年从事教学工作积累的成果，后来又以我作为业余无线电接线员(编号为K4GWQ)的经历对该书进行了补充和完善。我认为读者只有练习过书中的课外习题后，才能理解书中的技术内容。因此，本书为读者设计了550多道习题。有些习题比较容易，这样可以使那些刚开始学习的同学不会感到吃力。对于那些学习程度更深的同学，也有难度足够大的习题让他们去练习。所有的习题都能激励学生积极思考，从而加深对通信系统的理解。

感谢在本书的编写过程中帮助过我的许多人，以及多年来对本书的编写工作提出过建设性意见的那些人。特别要感谢得克萨斯大学的 K. R. Rao，奥本大学的 Jitendra J. Tugnait，Rensselaer 理工学院的 John F. McDonald，Rose-Hulman 理工学院的 Bruce A. Ferguson，Hartford 大学的 Ladimer S. Nagurney，波士顿大学的 Jeffrey Carruthers，加州大学 Long Beach 分校的 Hen-Geul Yeh。还要感谢我在佛罗里达大学的同事们的帮助。最后还要感谢我的妻子 Margaret Couch 博士，是她帮助我打印并校对了本书的原稿和修订稿。

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