

McGraw-Hill's BEST

BASIC ENGINEERING SERIES AND TOOLS

The Engineering Student Survival Guide

THE MCGRAW – HILL COMPANIES
FOR DONATION ONLY
NOT FOR RESALE

HIGHER EDUCATION
20INB001

THE MCGRAW – HILL COMPANIES
FOR DONATION ONLY
NOT FOR RESALE

K. Donaldson

The Engineering Student Survival Guide

K. Donaldson



Boston Burr Ridge, IL Dubuque, IA Madison, WI New York San Francisco St. Louis
Bangkok Bogotá Caracas Lisbon London Madrid
Mexico City Milan New Delhi Seoul Singapore Sydney Taipei Toronto

WCB/McGraw-Hill

A Division of The McGraw-Hill Companies

THE ENGINEERING STUDENT SURVIVAL GUIDE

Copyright © 1999 by The McGraw-Hill Companies, Inc. All rights reserved. Printed in the United States of America. Except as permitted under the United States Copyright Act of 1976, no part of this publication may be reproduced or distributed in any form or by any means, or stored in a database or retrieval system, without the prior written permission of the publisher.

This book is printed on acid-free paper.

4 5 6 7 8 9 0 DOC/DOC 9 3 2 1 0 9 8

ISBN 0-07-228647-4

Vice president/Editor-in-Chief: Kevin T. Kane
Publisher: Thomas Casson
Executive editor: Eric M. Munson
Developmental editor: Holly Stark
Marketing manager: John T. Wannemacher
Project manager: Kimberly Schau
Production associate: Debra R. Benson
Freelance design coordinator: JoAnne Schopler
Cover design and interior illustrations: Daniel Kim
Compositor: Electronic Publishing Services, Inc.
Typeface: 10/12 Palantino
Printer: R. R. Donnelley & Sons Company

CREDITS

Page vii: Courtesy of The Herbert Hoover Presidential Library; **Page 30:** Courtesy United Media; **Page 32:** Courtesy Derek Reamon, Doctoral Student, Stanford University; **Page 43:** From *The Bulletin of Vanderbilt University 1994/5 Undergraduate Catalog*, reproduced by permission of Vanderbilt University; **Page 57:** From *Webster's College Dictionary*, ed. Robert B. Costello, copyright © 1991 by Random House, Inc.; **Page 85:** Excerpt from *Linear Algebra and Its Applications*, Third Edition by Gilbert Strang, copyright © 1988 by Harcourt Brace & Company, reproduced by permission of the publisher; **Page 131:** Excerpt from *Genius: The Life and Science of Richard Feynman* by James Gleick, copyright © 1993, Vintage Books, Pantheon Books, a Division of Random House, Inc.

Library of Congress Cataloging-in-Publication Data

Donaldson, Krista.

The engineering student survival guide / Krista Donaldson.

p. cm. — (McGraw-Hill's BEST—basic engineering series and tools)

Includes bibliographical references (p.).

ISBN 0-07-228647-4

1. Engineering--Study and teaching (Higher)--United States.
2. Engineering students--United States. 3. College student orientation--United States. I. Title. II. Series.

T73.D66 1999

620'.0071'173--dc21

98-38255

<http://www.mhhe.com>

Foreword

Engineering educators have had long-standing debates over the content of introductory freshman engineering courses. Some schools emphasize computer-based instruction, some focus on engineering analysis, some concentrate on graphics and visualization, while others emphasize hands-on design. Two things, however, appear certain: no two schools do exactly the same thing, and at most schools, the introductory engineering courses frequently change from one year to the next. In fact, the introductory engineering courses at many schools have become a smorgasbord of different topics, some classical and others closely tied to computer software applications. Given this diversity in content and purpose, the task of providing appropriate text material becomes problematic, since every instructor requires something different.

McGraw-Hill has responded to this challenge by creating a series of modularized textbooks for the topics covered in most first-year introductory engineering courses. Written by authors who are acknowledged authorities in their respective fields, the individual modules vary in length, in accordance with the time typically devoted to each subject. For example, modules on programming languages are written as introductory-level textbooks, providing material for an entire semester of study, whereas modules that cover shorter topics such as ethics and technical writing provide less material, as appropriate for a few weeks of instruction. Individual instructors can easily combine these modules to conform to their particular courses. Most modules include numerous problems and/or projects, and are suitable for use within an active-learning environment.

The goal of this series is to provide the educational community with text material that is timely, affordable, of high quality, and flexible in how it is used. We ask that you assist us in fulfilling this goal by letting us know how well we are serving your needs. We are particularly interested in knowing what, in your opinion, we have done well, and where we can make improvements or offer new modules.

Byron S. Gottfried
Consulting Editor
University of Pittsburgh

ENGINEERING

It is a great profession. There is the fascination of watching a figment of the imagination emerge through the aid of science to a plan on paper. Then it moves to realization in stone or metal or energy. Then it brings homes and jobs to men. Then it elevates the standards of living and adds to the comforts of life. That is the engineer's high privilege.

The great liability of the engineer compared to men of other professions is that his works are out in the open where all can see them. His acts, step by step, are in hard substance. He cannot argue them into thin air or blame the judge like lawyers. He cannot, like the politicians, screen his shortcomings by blaming his opponents and hope the people will forget. The engineer simply cannot deny he did it.

On the other hand, unlike the doctor his life is not a life among the weak. Unlike the soldier, destruction is not his purpose. Unlike the lawyer, quarrels are not his daily bread. To the engineer falls the job of clothing the bare bones of science with life, comfort, and hope. No doubt as years go by the people forget which engineer did it, even if they ever knew. Or some politician put his name on it. Or they credit it to some promoter who used other people's money . . . But the engineer looks back at the unending stream of goodness which flows from his successes with satisfaction that few professionals may know. And the verdict of his fellow professionals is all the accolade he wants.

—Herbert Hoover, American Mining Engineer
and thirty-first U. S. President (1874–1964)

Preface

This isn't a book about how to get along with your roommate or how to balance your college budget (hey—you're an engineer, a calculator is never far away). I've tried to avoid phrases like (ugh!) *time management*, *goal setting*, and *finding yourself*. The assumption has been made that you have found yourself and an engineering program for yourself. Less lofty and more useful topics will be covered. Engineering students are perceived to have a heavier workload than the average student. That perception is, well . . . pretty much correct, but the perception that we have to give up our social lives is simply not true.

What this book *is* about is how to learn as much as you can, get choice grades, and still have fun while pursuing an engineering degree. You will find strategies to ace tests, navigate your way around campus without looking and feeling too much like a freshman, learn to love your computer in times of cyber-crisis, and pull through end-of-the-quarter slams in ways that are specific to *engineers*. Did you notice that we always get left out of college handbooks? It must be that we are just too intimidating.

Enough said. Prefaces are usually a drag. Much of this is common sense and ever more is I-wish-someone-had-told-me-this-when-I-was-a-freshman. I can't say I always follow my own advice, so take only what you like and have fun.

K. D.

Brief Contents

1. Let's Take a Shot at Defining Success 3
2. Before You Go—Preparation for Education? 7
3. Getting Oriented—Arriving on Campus 21
4. The Undergrad Engineering Experience 27
5. Choosing a Major and Selecting Classes 39
6. In Class—More to Staying Awake than Taking Notes? 49
7. Outside the Classroom—Workload and Studying 65
8. Quizzes, Tests, and Exams 89
9. When the Going Gets Tough . . . Dealing with Ruts
and Unmarked Pitfalls 105
10. Balancing It All 115
11. Beyond the Bachelor's Degree—Things to Think About
Midway Through 133

Contents

Preface xv

1. Let's Take a Shot at Defining Success 3
2. Before You Go—Preparation for Education? 7
 - Four Ways to Give Yourself a Head Start before College 7
 - Great Going-to-College Gift Ideas for Yourself (or, Good Tools to Bring) 9
 - A Heads-Up on Housing 12
 - Buying a Computer—Advice to the Wise 13
 - Five Questions for the Potential Computer Purchaser 13
 - How About a Printer to Go with That Computer? 17
3. Getting Oriented—Arriving on Campus 21
 - Ten Things to Do That Will Make You Feel Less Like a Freshman When Classes Start 21
4. The Undergrad Engineering Experience 27
 - The Time Frame We Are Looking At 27
 - Your Professors 28
 - A Few Dos and Don'ts for Dealing with Profs 29
 - All About Engineers: Culture, Characteristics, and Quirks 30
 - More on Individuals 32
 - The Female Engineer 32
 - The Minority Engineer 33
 - The "Older" (Returning to School) Engineer 35

5.	Choosing a Major and Selecting Classes	39
	Choosing a Major	39
	Minors, Double Majors, Honors Degrees, and Other Things	41
	Selecting and Registering for Classes, Sort of	42
6.	In Class—More to Staying Awake than Taking Notes?	49
	The Classroom Environment	49
	Note Taking and Paying Attention	50
	How to Suck the Marrow out of Class	55
	Save that Syllabus	57
	Lab Periods and the Law of Labs	60
7.	Outside the Classroom—Workload and Studying	65
	Problem Sets	65
	The Bright Side of Problem Sets	66
	Programs	69
	Lab Reports	69
	The Overachiever's Lab Format	72
	Projects	77
	Small, Piddly Projects (SPPs)	77
	Big Term Undertakings (BTUs)	78
	Group Projects	79
	Presentations	82
	Papers	84
	Maintenance Studying	85
	Studying from the Textbook	85
	What to Do When the Textbook Stinks!	86
	Studying from Class Notes	87
	Studying from Problem Sets	87
8.	Quizzes, Tests, and Exams	89
	Studying for Tests	89
	Step 1. Organize Your Troops (You and Your Notes)	90
	Step 2. Be Strategic and Formulate a Game Plan	91
	Step 3. Review Old Campaigns (Tests)	93
	Step 4. Review Class and Text Notes	94
	Step 5. Practice Problems	94
	Step 6. Know Your Study Sheet	95
	Charge! The Test	95
	What's the Mode of Attack?—Multiple Choice, Short Answer, or Long Answer?	96
	Multiple Choice	96
	Short Answer	97
	Long Answer	98
	Getting the Test Back	102

9. When the Going Gets Tough . . . Dealing with Ruts and Unmarked Pitfalls 105

xiii

CONTENTS

Ruts	106
Burnout	106
Sleeping All the Time	107
Too Much to Do	107
TV and the Wednesday Night Beer	108
Pitfalls	109
Computer Hell	109
Can't Get into a Class You Need to Get into?	110
End-of-the-Term Slam	111
Adverse Advisors	111
Can't Stand the Instructor	112
Girlfriends, Boyfriends, and Other Possibly Neglected Distractions	112

10. Balancing It All 115

Life, School, and Sanity	115
Keeping Your Battery Charged and Motor Running . . .	116
Caffeine: Engineer's Friend or Foe?	116
Is It Possible to Spend Too Much Time with Your Computer?	117
Anxiety and Stress	119
Extracurricular Activities	122
The Life of an Engineering Student—Work Hard, Play Hard	122
Playing a Varsity Sport or Working While in School	123
Job Prospects for Engineering Majors	123
The Ben Balance	125
Art	125
Out of Touch	126
Life 101	127
The Big Picture	127
Hands-On Application	128
Communication Skills	129
Other People	129
The Counter-Creativity Myth	129

11. Beyond the Bachelor's Degree—Things to Think About Midway Through 133

A License to Engineer?	133
The EIT (a.k.a. FE) Rundown: How the Process Works	134
The Examination Itself	134
On to Bigger and Better . . . Things? Places? Adventures?	138
The Engineering Job	139
The Inside Scoop on the Engineering Interview	140
Grad School	142
Not-Really Engineers	145

Appendix A Discipline-Specific Engineering Societies 147

Appendix B	Special Interest Societies	150
Appendix C	Engineering Honor Societies	152
Appendix D	Some Useful Stuff	153
Appendix E	Sample Resume	160
Bibliography—Thanks for the Info!		161
Dedication		163
Acknowledgments		165
About the Author		167
Index		169

The Engineering Student Survival Guide



Let's Take a Shot at Defining Success

So it's all in how you define it.

Right? Sort of. As you pass through the hallowed academic hallways, others will also get a shot at defining your success with grades, friendships, and respect. Even so, ultimately *you* define your own success by setting your own expectations, limits, standards, and goals.

You've chosen your school, decided to be an engineer—or at least get an engineering education!—and even may have selected your discipline. Mom and Dad are proud. Your high school or junior college math and sciences teachers are pleased. Your older (nonengineering) friends already at university are impressed—“You know engineering is pretty hard . . . Wow.”

Engineers are admired. Engineers are cool. There is a reason:

Engineering *is* hard.

You will at times (like during the 2:00 A.M. millionth attempt at debugging a computer science assignment) curse the person who said that the college years are the best years of one's life. Many late nights aren't spent partying, but working on problem sets (while your friends may be partying). Engineering students typically have longer exams than other majors and more of them. Everything you learn builds on itself.

To become an engineer (admired and cool):

You must work (very hard).

Those two points are the most important things to understand up front. The good thing is that the harder you think you have to work, the less you will realize it. Not overly comforting, eh? College isn't any less fun because you have more work to do. The more work you do, the more you appreciate your fun times.

College definitely shouldn't be all work. Given that and talking to lots of folks in and out of school, a survey says (in "Family Feud" style) that a truly successful undergraduate engineering experience requires at least the following:

- ☺ A solid understanding of what was taught to you (which is hopefully reflected by your grades).
- ☺ Confidence at graduation that you are academically prepared for your next adventure whether it is in the work world or graduate school.
- ☺ Great friends.
- ☺ More "growing experiences" than you felt were needed or to which you were entitled.
- ☺ Awesome memories with which to torture your grandchildren.
- ☺ Time and opportunity to develop completely random interests.

The above goals may seem long range and abstract, but they come easily if you can maintain the daily LSS (Life, School, and Sanity) Balance and achieve the Ben Balance. The LSS and Ben Balances are discussed in Chapter 10, but for now that means simply that you are pleased with yourself and your surroundings on a daily basis.

So, back to success and its definition. Personal success is what makes you happy, whether it is a slick free body diagram, a perfect score on a problem set, a computer science program that *finally* works, or being able to go to bed at a decent hour before a big test. Love what you do—or at least like most of it. Engineering is cool.

*Science can amuse and fascinate us all,
but it is engineering that changes the world.*

—ISAAC ASIMOV

Russian-American biochemist
and writer (b. 1920)

