Proposal for the BSEE Curriculum for the 2002-2004 Catalog

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On Behalf of the BSEE Curriculum Committee

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http://www.ece.utexas.edu/~bevans/eereform/

Dressed for Success Tomorrow

- **Mastery of "hard" skills**
  - Fundamentals of mathematics, physics, *biology*
  - Theory and practice of electromagnetics, devices, circuits, systems, software, *networking*
  - *Design principles, abstraction, and complexity*

- **Mastery of "soft" skills**
  - Oral and written engineering communication
  - Business practice of *marketing*, *budgeting*, product development, and ethics

BSEE Curriculum

1998-2000 BSEE Degree

Electromag. and Devices (3 courses)

Circuits (6 courses)

Systems (3 courses)

Digital Hardware (2 courses)

Software (1 course)

Engineering Comm. (3 courses)

EE 302

PHY 303L

EE 411

EE 316

EE 312

EE 155

EE 325

EE321

EE 338

EE 313

EE 319K

EE 333T

EE 339

EE 338K

EE 351K

Adv. Lab.

EE 362K

EE 464H/K
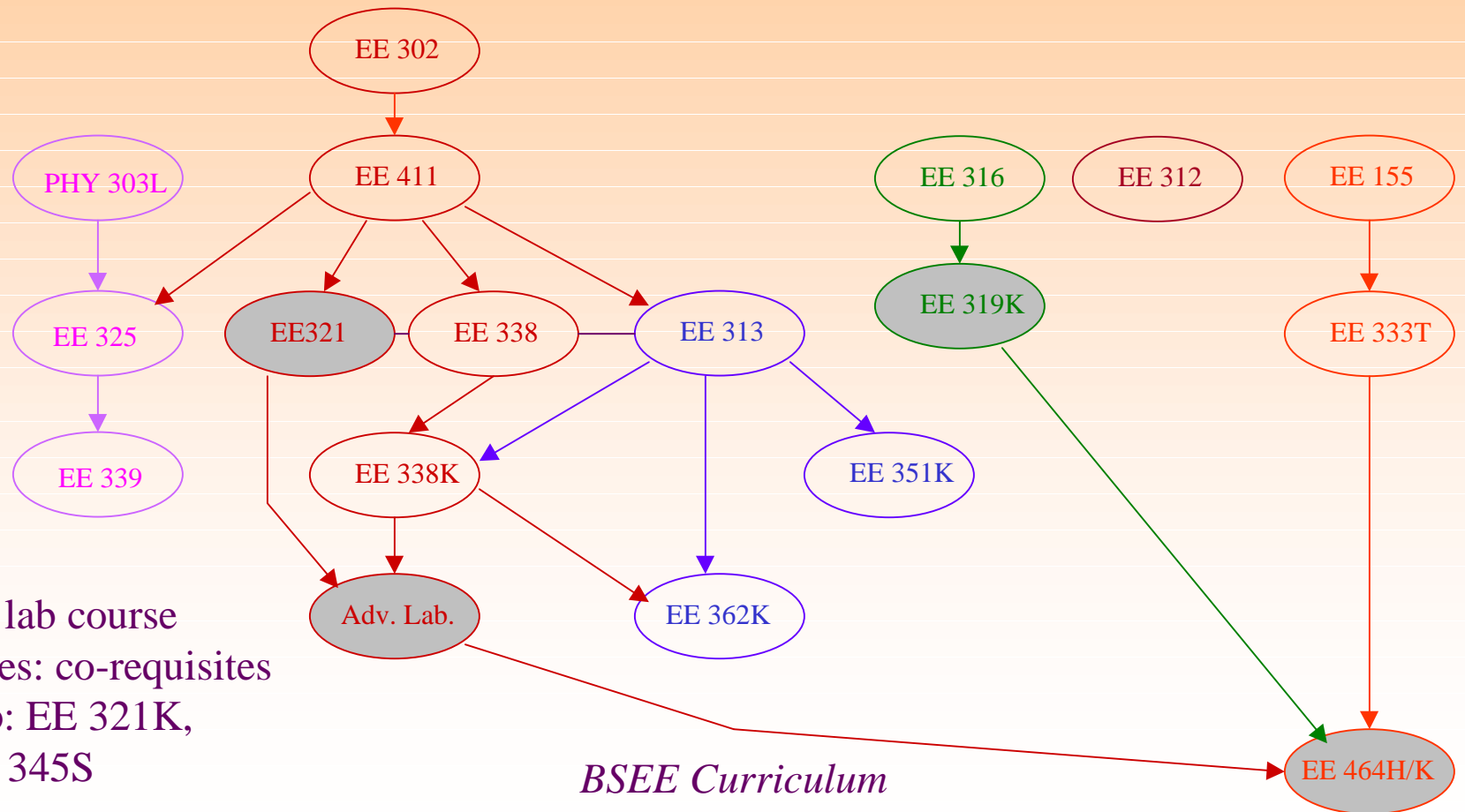
- Shading: lab course
- Black lines: co-requisites
- Adv. Lab: EE 321K, 345M, or 345S

BSEE Curriculum

1998-2000 BSEE Curriculum

Topic	Percentage	Credit Hours	Courses
analog circuits/systems	40%	24.5	2/3 EE302 + 2/3 EE313 + EE411 + 1/2 EE321 + EE321K + EE338 + EE338K + EE351K + EE362K
specialization	18%	11.0	1/2 EE464H/K + 3 tech. area electives
analog devices/ electromagnetics	10%	6.0	EE325 + EE339
engineering communication	9%	5.6	EE155 + EE333T + 4/10 EE464H/K
digital logic/microprocessors	8%	5.0	1/6 EE302 + EE316 + 1/2 EE319K
programming	8%	4.5	EE312 + 1/2 EE319K
discrete-time processing/ data acquisition	4%	2.5	1/3 EE313 + 1/2 EE321
business practice	2%	0.9	1/6 EE302 (ethics) + 1/10 EE464H/K (ethics)
Total	100%	60.0	

Required EE courses: 51 hours
Technical area electives: 9 hours

Hard skills: 53.3 hours
Soft skills: 6.7 hours

Possible 2002-2004 BSEE Degree
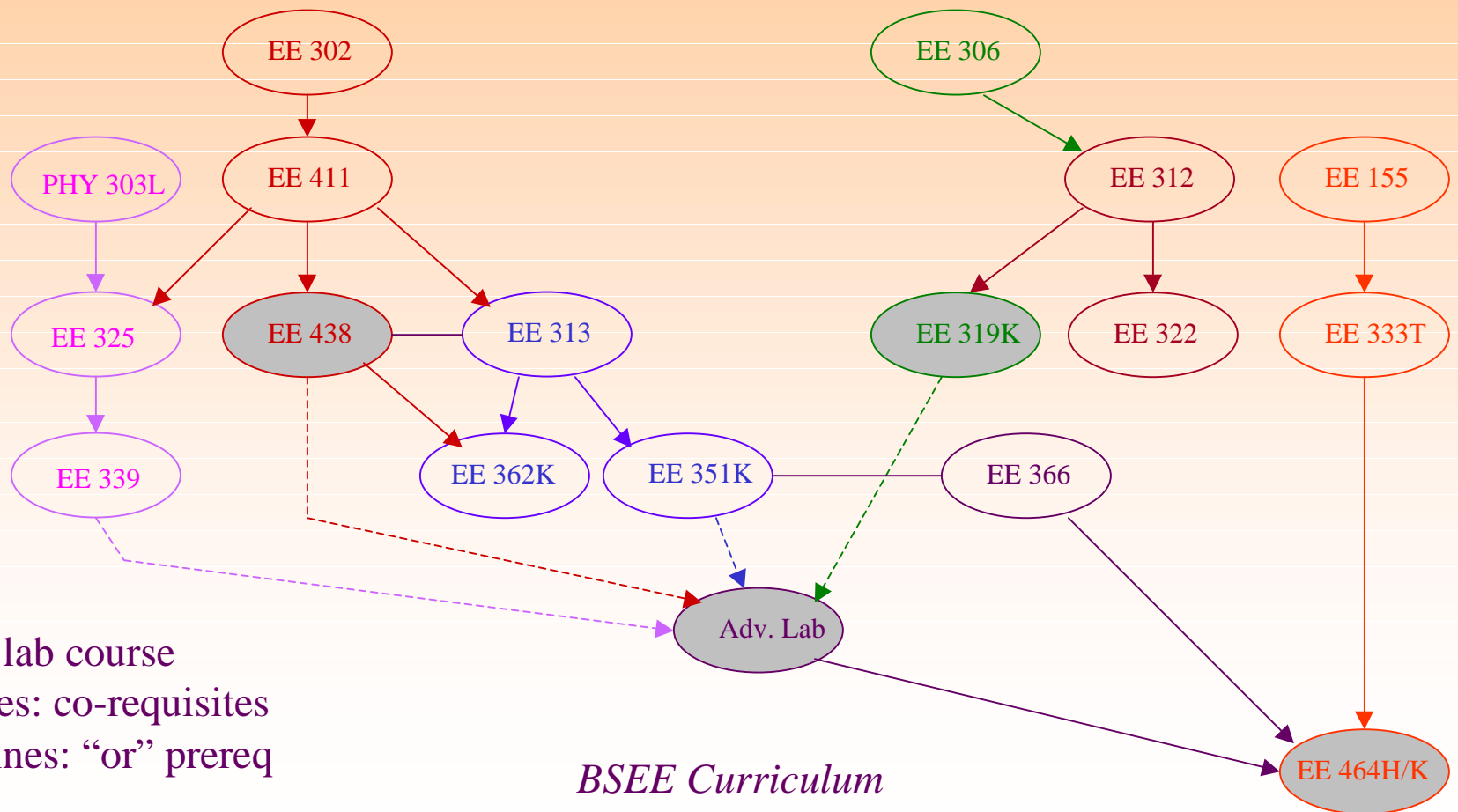
Electromag. and Devices (3 courses)   **Circuits** (3 courses)   **Systems** (3 courses)   **Digital Hardware** (2 courses)   **Software** (2 courses)   **Engineering Comm.** (3 courses)

- EE 302
- EE 306
- PHY 303L
- EE 411
- EE 312
- EE 155
- EE 325
- EE 438
- EE 313
- EE 319K
- EE 322
- EE 333T
- EE 339
- EE 362K
- EE 351K
- EE 366
- Adv. Lab
- EE 464H/K

- Shading: lab course
- Black lines: co-requisites
- Dashed lines: "or" prereq

BSEE Curriculum

Advanced Laboratory Course

- **Prepare a student for Senior Design**
  - EE321 Electrical Engineering Lab I
  - EE440 Microelectronics Fabrication Tech.
  - EE345L Microprocessor Interfacing Lab
  - EE345S Real-Time Digital Sig. Proc. Lab OR
  - EE374L Applications of Biomedical Eng.
- **Leverage student's technical area**
  - Counted as technical area elective for BSEE

Possible 2002-2004 Curriculum

Topic	Percentage	Credit Hours	Formula
specialization	30%	20.0	Advanced Lab + 1/2 EE464H/K + 5 technical area electives
analog circuits/systems	24%	16.5	1/2 EE302 + 2/3 EE313 + EE411 + 3/4 EE438 + EE351K + EE362K
digital logic/ microprocessors	10%	6.5	1/6 EE302 + EE306 + EE319K
programming	9%	6.0	EE312 + EE322
analog devices/ electromagnetics	9%	6.0	EE325 + EE339
engineering communication	8%	5.6	EE155 + EE333T + 4/10 EE464H/K
business practice	6%	3.9	1/6 EE302 (ethics) + 1/10 EE464H/K (ethics) + EE366 (economics)
discrete-time processing/ data acquisition	4%	2.5	1/6 EE302 + 1/3 EE313 + 1/4 EE438
Total	100%	67.0	

Required EE courses: 49 hours

Technical area electives: 18 hours

Hard skills: 57.5 hours

Soft skills: 9.5 hours

BSEE Curriculum

7

2002-2004 BSEE Curriculum

Topic	1998-2000 Credit Hours	2002-2004 Credit Hours
specialization	11.0	20.0
analog circuits/systems	24.5	16.5
digital logic/ microprocessors	5.6	6.5
programming	4.5	6.0
analog devices/ electromagnetics	6.0	6.0
engineering communication	5.6	5.6
business practice	0.9	3.9
discrete-time processing/ data acquisition	2.5	2.5
Total	60.0	67.0

Changes are shown in yellow

BSEE Curriculum

More Choices, Faster Access

- **Students choose two technical areas**
  - BSEE students could only choose one before
  - BS Comp. Eng. students had no choice before
  - Two technical electives support technical area
- **More choices of technical areas**
  - 15 technical areas instead of 9
  - Each technical area has 4-8 courses
  - First semester juniors can access technical area

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9

Tech Areas: EE Emphasis, Part 1

- **Unchanged technical areas**
  - Electromagnetic Engineering
  - Management and Production
  - Power Systems and Energy Conversion
- **New Electronics technical area**
  - Eight courses
  - Includes EE 321, EE 321K, and EE 338K
  - Allows smooth transition from previous catalogs

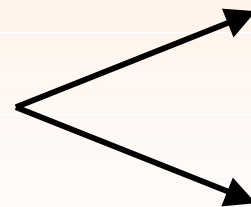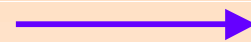*BSEE Curriculum*
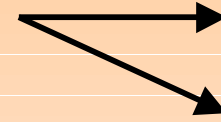
Tech Areas: EE Emphasis, Part 2

2000-2002

Biomedical Eng. / Premedical

Info. Sys. Eng.

Electronic Devices, Materials, and Int. Electronics

Telecomm./Signal Processing

2002-2004

Biomedical Eng.
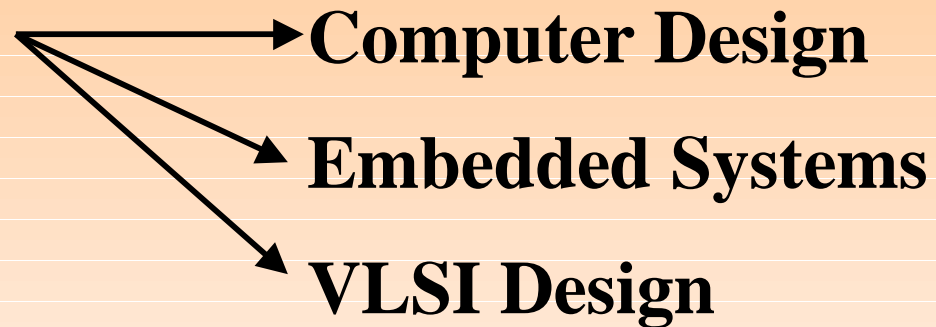
Premedical

Robotics/Controls

Electronic Materials/Devices

Comm./Networking

Signal and Image Processing

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11

Tech Areas: Comp. Eng. Emphasis

2000-2002

2002-2004

Computer Engineering → **Computer Design**

→ **Embedded Systems**

→ **VLSI Design**

Software Engineering → **Software Development**

→ **System Software**

Possible Impact of Reform

- **Transfer students in 1999-2000**
  - 18.9% of new ECE students in 1999-2000
  - 11 fresh., 39 soph., 24 juniors, 12 seniors
- **Transfer students could finish in 2 years if they have completed 2 years elsewhere**
- **Total number of hours (128 hours now)**
  - BSEE degree at 123 hours
  - BS Comp. Eng. degree at 123 hours

BSEE Curriculum

Motivations to Pursue BSEE

- **Early 1980s:** home computers, MTV, voiceband data modems, bulletin boards

- **Late 1980s:** PCs, analog cell phones, audio CD players, bulletin boards

- **Early 1990s:** laptops, digital cell phones, video CDs, Internet browsing

- **Late 1990s:** palm pilots, Internet cell phones, DVDs, MP3 players, ADSL

BSEE Curriculum

14

Trends in Consumer Electronics

- **Increasing amount of communications, signal processing, networking capabilities**

- **Increasingly digital: software larger role**

- **Analog, RF, optical subsystems needed to interface systems to physical world**

- **Devices & semiconductor manufacturing**
  - Shrinking area, volume & power consumption
  - Exponential increase in processor speeds

BSEE Curriculum

BSEE Technical Area Choices

Technical Area	Students	Percentage
Computer Engineering	230	37%
Telecommunications and Signal Proc.	99	16%
Management and Production	66	11%
Integrated Electronics	62	10%
Electronic Materials and Devices	28	5%
Electromagnetic Engineering	25	4%
Premed/Biomedical	25	4%
Software Engineering	23	4%
Communication and Control	21	3%
Biomedical Engineering	21	3%
Information Systems Engineering	12	2%
Power Systems and Energy	9	1%

Fall 1999 data for 621 BSEE students who declared.
Not included: 306 Comp. Eng. and 785 Undecided majors.

BSEE Curriculum

16

Digital Hardware Courses

- **EE306 Introduction to Computing**
  - Bottom-up treatment of computer architecture from gates to assembly language programming
  - Overlap with EE302, EE316, and EE319K which frees these courses to teach other topics

- **EE319K Intro. to Microcontrollers**
  - Move 50-75% of EE345L to EE319K
  - Move 50-75% of EE345M into EE345L
  - EE345M becomes a real-time OS course

BSEE Curriculum

17

Digital Hardware Courses

- **EE316 Digital Logic Design**
  - Pre-requisite: EE 306 or CS310
  - Current topics: digital logic
  - Suggested topics: digital logic, FPGAs, VHDL
  - Required for BS Comp. Eng. degree

- **EE316 as BSEE technical elective**
  - Required for Computer Design, Embedded Systems, and VLSI Design technical areas (applies to one-half of current BSEEs)

BSEE Curriculum

Appendix

Circuits and Systems Courses

Course	Remove	Add
EE302	Dynamic circuit analysis Digital system design	Signal/system representation Finite state machines
EE411	Two-port networks	Operational amplifiers Bode plots Three-phase circuits Laplace transforms
EE313	Signal/system representation Quantization	Review sig/sys representation AM/FM modulation
EE338		Two-port networks Lab component (EE438)
EE351K		Markov chains

Add one-hour lab component to EE338 to form EE438
No proposed changes to EE362K

BSEE Curriculum

Lab for EE 438 Electronic Circuits

- **Generation & acquisition of test signals**
  - Sinusoids and noise

- **Measure current, voltage, impedance**
  - 2/3-terminal devices; analyze mystery circuit

- **Complex transfer function measurement**
  - Transfer function, magnitude/phase response to sinusoid/noise input, Bode plot/breakpoints

- **Spectrum measurements and analysis**

BSEE Curriculum