KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS
DHAHRAN - KINGDOM OF SAUDI ARABIA

College of Computer Sciences and Engineering
Computer Engineering Department

STUDENT GUIDE

Academic Year 2003-2004

King Fahd University of Petroleum and Minerals

College of Computer Sciences and Engineering

Computer Engineering Department

Chairman:

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Al-Mouhamed, Mayez A.
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Associate Professors:

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Baroudi, Uthman A. R.
El-Maleh, Aiman
El-Rabaa, Mohammad El-Nasir S.
Gutub, Adnan A. A.
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Sqalli, Mohammed H.
Abu-Amara, Marwan

Lecturers:

Adiche, Hakim
Al-Ka'bi, Amin (Loan to ITC)
Al-Mulhem, Ahmed S.
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Hasan, Masudul
Kamal, Chenanoua
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College of Computer Sciences and Engineering
Department of Computer Engineering

Student Guide

INTRODUCTION

The dramatic reduction in the cost of digital systems over the last decade has led to an enormous growth in the use of computers. Today, computer engineering is one of the fastest growing university disciplines.

Computer engineering is a discipline of much interest and demand exists both in Saudi Arabia and elsewhere. Currently, there is a critical shortage of computer professionals who can design and implement computer systems and networks. The Kingdom of Saudi Arabia has focused on computer technology and its utilization as one of the fundamental tools to modernize its industry to cope up with advances in modern technology. Employment opportunities for qualified computer engineers are tremendous.

WHAT IS COMPUTER ENGINEERING?

Computer Engineering (COE) is the discipline concerned with the design, analysis, modeling, implementation and utilization of computers and networks systems. Both the software and the hardware aspects of these systems are studied in a balanced and coherent manner.

The COE program at KFUPM provides a comprehensive coverage of a wide range of COE subjects. These are presented below.

- Computer Architecture & Digital Design;
- Parallel and Distributed Systems;
- Communications and Networks;
- VLSI and Design Automation;
- Computer Applications.

STUDY IN COMPUTER ENGINEERING

The Computer Engineering Department provides a program that develops the necessary skills and competence required to design and implement computer systems and networks. The computer engineering curriculum emphasizes the areas of digital system architecture and design, microprocessors, integrated circuit technology, computer communication, and computer networks. In addition, sufficient emphasis is given to the study of computer science to provide a coherent view of computer systems and an understanding of the interdependencies of hardware and software components and their interfaces and tradeoffs.

The Computer Engineering Department offers a program leading to a B.S. degree in computer engineering, a program leading to an MS degree in computer engineering, and a Ph.D. program, jointly with the Information and Computer Science Department.

JOB OPPORTUNITIES

Job opportunities for computer engineers, which are on the increase, are available in various domains such as:

i) Data Communications & Computer Networks

Design of data communications and computer networks, and the installation and operation of such networks

ii) Computer & Microcomputer Engineering

Design of computer and microcomputer-based systems for dedicated applications involving machine control, interfacing machines, and computer installation and operation

iii) Information Technology Centers (ITC)

Computer installation and operation, computer performance measurements, analysis and improvement, and capacity planning

A partial list of government and private organizations currently requiring computer engineers includes:

- National Information Center
- Ministry of Defense and Aviation
- Advanced Electronics Company
- Saudi Aramco
- Financial institutions, especially those utilizing large networks and automated teller machines (ATM)
- Universities
- Computer companies and
- Commerce and Industry

This document contains the various courses offered by COE, information on graduation requirements, a list of electives, and catalog description & prerequisite of COE courses.

The COE Degree Requirements

The COE Department offers two options for its students. These are:
(1) B.S. in Computer Engineering and (2) B.S. in Computer Engineering with Co-Op.

The program requirements for each of these options are listed below.

Option I: B.S. in Computer Engineering.

Area	Courses	Credit-Hours
Basic Sciences	CHEM 101, PHYS 101, 102	**4** 4+4=**8**
Mathematics	MATH 101, 102, 201, 260 STAT 319	4+4+3+3=**14** **3**
English	ENGL 101, 102, 214	3+3+3=**9**
Physical Education	PE 101, 102	1+1=**2**
Islamic Studies and Humanities	IAS 111, 101, 211, 201, 311, 301, 4xx	2+2+2+2+2+2+2= **14**
Information & Computer Science	ICS 102, 201, 202, 252, 431, 353 (or 313)	3+4+4+3+4+3=**21**
Electrical Engineering	EE 201, 203	4+4=**8**
Electives	Xxx*, yyy, zzz	3+3+3=**9**
Computer Engineering	COE 200, 205, 305, 308, 342, 360, 390, 399, 400, 442, 485, 4xx, 4xx, 4xx	4+4+4+3+3+1+0+ 3+4+3+3+3+ 3+3=**41**
Total Credits		**133**

Option II: B.S. in Computer Engineering with Co-op.

Area	Courses	Credit-Hours
Basic Sciences	CHEM 101, PHYS 101, 102	**4** 4+4=**8**
Mathematics	MATH 101, 102, 201, 260 STAT 319	4+4+3+3=**14** **3**
English	ENGL 101, 102, 214	3+3+3=**9**
Physical Education	PE 101, 102	1+1=**2**
Islamic Studies and Humanities	IAS 111, 101, 211, 201, 311, 301, 4xx	2+2+2+2+2+2+2= **14**
Information & Computer Science	ICS 102, 201, 202, 252, 431, 353 (or 313)	3+4+4+3+4+3=**21**
Electrical Engineering	EE 201, 203	4+4=**8**
Electives	Xxx*, yyy	3+3=**6**
Computer Engineering	COE 200, 205, 305, 308, 342, 360, 390, 399, 400, 442, 4xx, 4xx	4+4+4+3+3+1+0+ 3+4+3+3+3= **35**
Co-Op	COE 350, COE 351	0+9=**9**
Total Credits		**133**

* xxx is a general elective which may include COE courses.

Department of Computer Engineering Curriculum
Computer Engineering Program

First Year (Preparatory)

Name	Num.	Title	LT	LB	CR	Name	Num.	Title	LT	LB	CR
MATH	001	Preparatory Math I	3	1	4	MATH	002	Preparatory Math II	3	1	4
ENGL	001	Preparatory English I	15	5	8	ENGL	002	Prep. English II	15	5	8
PE	001	Prep Physical Educ. I	0	2	1	PE	002	Prep. Physical Educ. II	0	2	1
ME	001	Prep. Shop I	0	2	1	ME	002	Prep. Shop II	0	2	1
Total			**18**	**10**	**14**				**18**	**10**	**14**

Total Credits required in Preparatory Program: 28

Second Year (Freshman)

Name	Num.	Title	LT	LB	CR	Name	Num.	Title	LT	LB	CR
MATH	101	Calculus I	4	0	4	MATH	102	Calculus II	4	0	4
PHYS	101	General Physics I	3	3	4	PHYS	102	General Physics II	3	3	4
CHEM	101	General Chemistry I	3	4	4	ICS	102	Introd. to Computing	2	3	3
ENGL	101	English Composition I	3	0	3	ENGL	102	English Composition II	3	0	3
IAS	111	Belief and its Conequences	2	0	2	IAS	101	Practical Grammar	2	0	2
						PE	101	Physical Education I	0	2	1
Total			**15**	**7**	**17**				**14**	**8**	**17**

Third Year (Sophomore)

COE	200	Fundam. of Comp. Eng.	3	3	4	COE	205	Comp. Org. & Ass. Lang.	3	3	4
EE	201	Electric Circuits I	3	3	4	EE	203	Electronics I	3	3	4
ICS	201	Introduction to CS	3	3	4	ICS	202	Data Structures	3	3	4
MATH	201	Calculus III	3	0	3	ICS	252	Discrete Structures	3	0	3
IAS	211	Ethics in Islam	2	0	2	MATH	260	Introduction to Linear Alg. & Diff. Equ.	3	0	3
						PE	102	Physical Education II	0	2	1
Total			**14**	**9**	**17**				**15**	**11**	**19**

Fourth Year (Junior)

COE	305	Microcomp. Syst. Design	3	3	4	COE	308	Computer Architecture	3	0	3
STAT	319	Prob &Stat. For Eng.&Sc.	2	3	3	COE	442	Computer Networks	3	3	4
COE	342	Data & Computer Comm.	3	0	3	COE	390	Seminar	1	0	1
COE	360	Principles of VLSI Desg.	3	0	3	ICS	xxx	ICS Elective	3	0	3
ENGL	214	Tech. Report Writing	3	0	3	xxx	xxx	Elective	3	0	3
IAS	201	Objective Writing	2	0	2	IAS	311	Islamic Shareah	2	0	2
Total			**16**	**6**	**18**				**15**	**3**	**16**
COE	399	COE Summer Training	0	0	0						

Fifth Year (Senior)

COE	485	Senior Design Project	1	6	3	COE	400	Digital system Design	1	6	3
COE	4xx	COE Elective	3	0	3	COE	4xx	COE Elective	3	0	3
ICS	431	Operating Systems	3	3	4	COE	4xx	COE Elective	3	0	3
xxx	xxx	Elective	3	0	3	xxx	xxx	Elective	3	0	3
IAS	301	Literary Styles	2	0	2	IAS	4xx	IAS Elective	2	0	2
Total			**12**	**9**	**15**				**12**	**6**	**14**

Sub Total	**57**	**31**	**67**				**56**	**28**	**66**
Total Credits required in COE B.S. Degree Program is:							**113**	**59**	**133**

Department of Computer Engineering Curriculum
Computer Engineering Program (With Co-op)

First Year (Preparatory)

Name	Num.	Title	LT	LB	CR	Name	Num.	Title	LT	LB	CR
MATH	001	Preparatory Math I	3	1	4	MATH	002	Preparatory Math II	3	1	4
ENGL	001	Preparatory English I	15	5	8	ENGL	002	Preparatory English II	15	5	8
PE	001	Prep Physical Educ. I	0	2	1	PE	002	Prep. Physical Educ. II	0	2	1
ME	001	Prep. Shop I	0	2	1	ME	002	Prep. Shop II	0	2	1
Total			**18**	**10**	**14**				**18**	**10**	**14**

Total Credits required in Preparatory Program: 28

Second Year (Freshman)

Name	Num.	Title	LT	LB	CR	Name	Num.	Title	LT	LB	CR
MATH	101	Calculus I	**4**	0	**4**	MATH	102	Calculus II	4	0	4
PHYS	101	General Physics I	3	3	4	PHYS	102	General Physics II	3	3	4
CHEM	101	General Chemistry I	3	4	4	ICS	102	Introd. to Computing	2	3	3
ENGL	101	English Composition I	3	0	3	ENGL	102	English Composition II	3	0	3
IAS	111	Belief and its Consequences	2	0	2	IAS	101	Practical Grammar	2	0	2
						PE	101	Physical Education I	0	2	1
Total			**15**	**7**	**17**				**14**	**8**	**17**

Third Year (Sophomore)

COE	200	Fundam. of Comp. Eng.	3	3	4	COE	205	Comp. Org & Ass. Lang.	3	3	4
EE	201	Electric Circuits I	3	3	4	EE	203	Electronics I	3	3	4
ICS	201	Introduction to CS	3	3	4	ICS	202	Data Structures	3	3	4
						ICS	252	Discrete Structures	3	0	3
MATH	201	Calculus III	3	0	3	MATH	260	Introduction to Linear Alg. &Diff. Equ.	3	0	3
IAS	211	Ethics in Islam	2	0	2	PE	102	Physical Education II	0	2	1
Total			**14**	**9**	**17**				**15**	**11**	**19**

Fourth Year (Junior)

COE	305	Microcomp. Syst. Desgn.	3	3	4	COE	308	Computer Architecture	3	0	3
STAT	319	Prob &Stat. Eng.&Sc.	2	3	3	COE	442	Computer Networks	3	3	4
COE	342	Data & Comp. Comm.	3	0	3	COE	390	Seminar	1	0	1
COE	360	Principles of VLSI Desg.	3	0	3	ICS	xxx	ICS Elective	3	0	3
ENGL	214	Tech. Report Writing	3	0	3	xxx	xxx	Elective	3	0	3
IAS	201	Objective Writing	2	0	2	IAS	311	Islamic Shareah	2	0	2
						IAS	301	Literary Styles	2	0	2
Total			**16**	**6**	**18**				**17**	**3**	**18**
COE	350	Co-operative work	0	0	0						

Fifth Year (Senior)

COE	351	Co-op. Work (cont.)	0	0	9	COE	400	Digital system Design	1	6	3
						COE	4xx	COE Elective	3	0	3
						COE	4xx	COE Elective	3	0	3
						ICS	431	Operating Systems	3	3	4
						xxx	xxx	Elective	3	0	3
						IAS	4xx	IAS Elective	2	0	2
Total			**0**	**0**	**9**				**15**	**9**	**18**

Sub Total			**45**	**22**	**61**				**61**	**31**	**72**
Total Credits required in COE B.S. Degree Program with co-op is:									**106**	**53**	**133**

List of COE Courses

1st. COE Core Courses

S.N.	Course	Title	Credit			Prerequisite
1-	COE 200	Fundamentals of Computer Engineering	3	3	4	Phys 102
2-	COE 205	Computer Organization and Assembly Language	3	3	4	COE 200 & ICS 201
3-	COE 305	Microcomputer System Design	3	3	4	COE 205
4-	COE 308	Computer Architecture	3	0	3	COE 205
5-	COE 342	Data & Computer Communications	3	0	3	STAT 319 (co-req.)
6-	COE 360	Principles of VLSI Design	3	0	3	EE 203
7-	COE 390	Seminar	1	0	1	JS
8-	COE 400	Digital system Design	1	6	3	COE 305&SS
9-	COE 442	Computer Networks	3	3	4	COE 342 OR CI
		Subtotal			**29**	

A-1. Option I (Regular)

1-	COE 399	Summer Training	0	0	0	ENGL 214, JS&DA
2-	COE 485	Senior Design Project	1	6	3	SS
		Subtotal	1	6	**3**	

A-2. Option II (Co-Op)

1-	COE 350	Cooperative Work	0	0	0	See details inside.
2-	COE 351	Cooperative Work (Continued)	0	0	9	
		Subtotal	0	0	**9**	

B. COE Elective Courses

1-	COE 402	Computer System Performance Evaluation	3	0	3	STAT 319 OR CI
2-	COE 403	Advanced Microprocessor Architecture	3	0	3	COE 305
3-	COE 405	Design and Modeling of Digital Systems	3	0	3	COE 308 OR CI
4-	COE 406	RISC Architectures	3	0	3	COE 308
5-	COE 409	Special Topics in Comp. Arch. & Dig. Syst. Des.	3	0	3	COE 308
6-	COE 410	Design of Sequential Systems	3	0	3	COE 200
7-	COE 420	Parallel Computing	3	0	3	COE 308
8-	COE 421	Fault-Tolerant Computing	3	0	3	COE 308
9-	COE 422	Real Time Systems	3	0	3	COE 305
10-	COE 423	Distributed Systems	3	0	3	SS
11-	COE 429	Special Topics in Parallel & Distributed Systems	3	0	3	SS
12-	COE 441	Local Area Networks	3	0	3	COE 342 OR CI
13-	COE 443	High Speed Networks	3	0	3	COE 342 OR CI
14-	COE 444	Internetwork Design and Management	3	0	3	COE 342 OR CI
15-	COE 445	Internet Information Services	3	0	3	SS
16-	COE 446	Mobile Computing	3	0	3	SS
17-	COE 449	Special Topics in Comp. Comm. And Networking	3	0	3	COE 342 OR CI
18-	COE 460	Advanced Digital Electronics	3	0	3	COE 360
19-	COE 462	Design Automation of VLSI Circuits	3	0	3	COE 360 OR CI
20-	COE 464	Testing of Digital Circuits	3	0	3	SS
21-	COE 465	VLSI System Design Methodology	3	0	3	COE 360
22-	COE 469	Special Topics in VLSI and Design Automation	3	0	3	COE 360
23-	COE 484	Introduction to Robotics	3	0	3	SS
24-	COE 487	Computer Vision Processing	3	0	3	SS
25-	COE 488	Data Acquisition Interfacing	3	0	3	COE 305
26-	COE 499	Special Topics in COE	3	0	3	SS
		Subtotal (Three COE Electives)			**9**	

List of other Core Courses

1-	ICS 102	Introduction to Computing	2	3	3	Math 101 or Math132
2-	ICS 201	Introduction to Computer Science	3	3	4	ICS 102
3-	ICS 202	Data Structures	3	3	4	ICS 201
4-	ICS 252	Discrete Structures	3	0	3	Math 101
5-	ICS 431	Operating Systems	3	3	4	ICS 232 or COE 205
6-	EE 201	Electric Circuits I	3	3	4	Phys 102, Math 102
7-	EE 203	Electronics I	3	3	4	EE 201

Curriculum Check List

B.S. in Computer Engineering (Regular)

Mathematics	cr	Gr	**Science**	cr	Gr	**Human. & Soc. Sc.**	cr	Gr
Math 101			Phys 101			IAS 111		
Math 102			Phys 102			IAS 101		
Math 201			Chem 101			IAS 211		
Math 260						IAS 201		
STAT 319						IAS 311		
						IAS 301		
						IAS 4xx		
						ENGL 101		
						ENGL 102		
						ENGL 214		
						PE 101		
						PE 102		

COE	**cr**	**Gr**
COE 200		
COE 205		
COE 305		
COE 342		
COE 360		
COE 308		
COE 442		
COE 390		
COE 485		
COE 400		
COE 399		

ICS	Cr	Gr		**EE**	cr	Gr
ICS 102				EE 201		
ICS 201				EE 203		
ICS 202						
ICS 252						
ICS 313 (or 353)						
ICS 431						

Curriculum Check List

B.S. in Computer Engineering (Co-op)

Mathematics	cr	Gr	**Science**	cr	Gr	**Human. & Soc. Sc.**	cr	Gr
Math 101			Phys 101			IAS 111		
Math 102			Phys 102			IAS 101		
Math 201			Chem 101			IAS 211		
Math 260						IAS 201		
STAT 319						IAS 311		
						IAS 301		
						IAS 4xx		
						ENGL 101		
						ENGL 102		
						ENGL 214		
						PE 101		
						PE 102		

COE	cr	Gr
COE 200		
COE 205		
COE305		
COE342		
COE360		
COE 308		
COE 442		
COE 390		
COE 400		
COE 399		
COE 350		
COE 351 (352)		

ICS	Cr	Gr		**EE**	cr	Gr
ICS 102				EE 201		
ICS 201				EE 203		
ICS 202						
ICS 252						
ICS 313 (or 353)						
ICS 431						

Electives to be taken by Undergraduate COE Students

All COE undergraduate students are required to take a number of electives. The details of the electives is given below

Coop:	2 COE-4XX	(COE Electives)
	2 XXX-XXX	(Free Electives)
	1 ICS-XXX	(ICS-353 or ICS-313)
Non-Coop:	3 COE-4XX	(COE Electives)
	3 XXX-XXX	(Free Electives)
	1 ICS-XXX	(ICS-353 or ICS-313)

- The COE department highly recommends that each student choose his set of electives so as to build a focus on one specialized area. Currently, the department has identified FOUR areas. These are Communications & Computer Networks, Computer Applications, Computer Systems, and Software. The choice of the set of electives for the purpose of building a focus on a given track should be done in consultation with the student academic advisor.
- A student who wishes to specialize in one of the four identified COE tracks may choose FOUR courses from the list shown in attachment #1 to fulfill his elective requirements.
- The ICS elective must be either ICS 353 Design and Analysis of Algorithms or ICS 313 Programming Languages.
- The COE electives can be any non-required COE 400-level course.
- An elective course should fulfill the following requirements:
  1. Registration for 200-level courses is generally discouraged unless it is absolutely necessary, such as being a prerequisite to a second elective, or it is the only available electives for a graduating student.
  2. The course should not be from ENGL, IAS, or PE departments.
  3. The course should not be similar to any core course in the COE program or any other elective taken.
  4. The course is highly recommended to be from the attached list of Recommended Electives (see attachment # 2) and in any case the course should be on the list of approved electives provided in attachment #3. A course not listed in this attachment may be taken if the advisor approves it and if it satisfies the above 3 requirements.

Attachment #1 - COE Electives Guidelines

Communications & Networks Focus

COE 402	Computer System Performance Evaluation
COE 423	Distributed Systems
COE 441	Local Area Networks
COE 443	High Speed Networks
COE 444	Internetwork Design and Management
COE 445	Internet Information Services
COE 446	Mobile Computing
EE 207	Signals & Systems
ICS 353	Design and Analysis of Algorithms

Computer Applications

COE 402	Computer System Performance Evaluation
COE 422	Real Time Systems
COE 445	Internet Information Services
COE 488	Data Acquisition Interfacing
COE 484	Introduction to Robotics
COE 487	Computer Vision Processing
ICS 334	Database Systems

Computer Systems Focus

COE 402	Computer System Performance Evaluation
COE 405	Design and Modeling of Digital Systems
COE 406	RISC Architectures
COE 421	Fault-Tolerant Computing
COE 422	Real Time Systems
COE 462	Design Automation of VLSI Circuits
COE 464	Testing of Digital Circuits
COE 465	VLSI System Design Methodology
COE 488	Data Acquisition Interfacing

Software Focus

COE 402	Computer System Performance Evaluation
COE 420	Parallel Computing
COE 444	Internetwork Design and Management
COE 445	Internet Information Services
ICS 313	Fundamentals of Programming Languages
ICS 334	Database Systems
ICS 413	Software Engineering

Attachment #2 - List of Recommended Electives

S.N.	Course #	Course Title	Credits	Prerequisites
1	ECON 403	Engineering Economics	3-0-3	None
2	EE 207	Signals & Systems	3-0-3	EE 201
3	EE 370	Communications Engineering I	3-3-4	EE 207, EE 203
4	EE 380	Control Engineering I	3-3-4	EE 207
5	EE 406	Digital Signal Processing	3-0-3	EE 370
6	EE 430	Information Theory & Coding	3-0-3	EE 315, EE 370
7	ICS 314	Object-Oriented Programming	3-0-3	ICS 313
8	ICS 331	Systems Software	3-0-3	ICS 202, ICS 232
9	ICS 334	Database Systems	3-3-4	ICS 202
10	ICS 353	Design and Analysis of Algorithms	3-0-3	ICS 202
11	ICS 413	Software Engineering	3-3-4	ICS 202
12	ICS 484	Arabization of Computers	3-0-3	SS
13	MATH 425	Graph Theory	3-0-3	Math 280 or Math 260
14	MATH 480	Linear & Non-Linear Prog.	3-0-3	Math 280, ICS 101, ICS 102, ICS 103
15	MGT 301	Principles of Management	3-0-3	J.S.
16	MIS 301	Business Systems Analysis & Design I	3-0-3	MS 215 or Departmental Approval
17	SE 303	Operation Research I	3-3-4	SE 201, SE 205 or STAT 319
18	SE 301	Numerical Methods	3-0-3	ICS 101, MATH 201
19	SE 305	Optimization Methods	2-3-3	SE 301, Co. SE 303
20	SE 320	Quality Control & Industrial Statistics	3-0-3	SE 205 or STAT 319, Co. SE 325
21	SE 405	Stochastic Systems Simulation	2-3-3	SE 205 or STAT 319

Attachment #3 - **List of Approved Electives**

Course #	Course Title	Credits	Prerequisites
ARE 201	Architectural Graphics	0-6-2	-
ARE 443	Computer-Aided building Design	2-3-3	ARE 221
ARE 444	Knowledge-Based Systems in Buildings	2-3-3	ICS 102, ARE 221
CHE 453	Mathematical Methods in Chemical Engineering	3-0-3	SE 301 or SS
ECON 403	Engineering Economics	3-0-3	None
EE 207	Signals & Systems	3-0-3	EE 201
EE 303	Electronics II	3-3-4	EE 203
EE 340	Electromagnetics	3-3-4	EE 201, MATH 302
EE 370	Communications Engineering I	3-3-4	EE 207, EE 203
EE 380	Control Engineering I	3-3-4	EE 207
EE 400	Telecommunication Networks	3-3-4	EE 315, ICS 103
EE 406	Digital Signal Processing	3-0-3	EE 370, EE 380
EE 415	Analog Integrated Circuits Analysis & Design	3-0-3	EE 303
EE 417	Communication Engineering II	3-0-3	EE 315, EE 370
EE 420	Optical Fiber Communications	3-3-4	EE 340, EE 370
EE 430	Information Theory & Coding	3-0-3	EE 315, EE 370
EE 432	Digital Control Systems	3-3-4	EE 380
EE 433	Applied Control Engineering	3-3-4	EE 380
GEOL 454	Computational Methods in Geology	2-3-3	Dept. permission – JS
GS 423	International relations	3-0-3	None
ICS 313	Fundamentals of Prog. Languages	3-0-3	ICS 202
ICS 314	Object-Oriented Programming	3-0-3	ICS 313
ICS 331	Systems Software	3-0-3	ICS 202, ICS 232
ICS 333	File Processing	3-0-3	ICS 202
ICS 334	Database Systems	3-3-4	ICS 202
ICS 354	Automata and Language Translation Sys.	3-0-3	ICS 252
ICS 353	Design and Analysis of Algorithms	3-0-3	ICS 202
ICS 381	Introduction to Artificial Intelligence	3-0-3	ICS 251
ICS 413	Software Engineering	3-3-4	ICS 202
ICS 434	Advanced Database Systems	3-0-3	ICS 334
ICS 435	Computer Graphics	3-0-3	ICS 202
ICS 452	Theory of Computing	3-0-3	ICS 252

ICS 471	Parallel and Distributed Processing	3-0-3	ICS 431
ICS 481	Neural Networks	3-0-3	SS
ICS 482	Natural Language Understanding	3-0-3	SS
ICS 483	Computer Vision	3-0-3	ICS 381
ICS 484	Arabization of Computers	3-0-3	SS
ICS 485	Knowledge Based Systems	3-0-3	SS
MATH 301	Methods of Applied Mathematics	3-0-3	MATH 202
MATH 311	Advanced Calculus I	3-0-3	MATH 201
MATH 321	Introduction to Numerical Computing	3-0-3	MATH 201, ICS 101, ICS 102 or ICS 103
MATH 421	Introduction to Topology	3-0-3	MATH 311, MATH 232
MATH 425	Graph Theory	3-0-3	MATH 280 or MATH 260
MATH 430	Introduction to Complex Variables	3-0-3	MATH 201
MATH 442	Calculus of Variations & Optimal Control	3-0-3	MATH 202, MATH 280, MATH 311
MATH 460	Applied Matrix Theory	3-0-3	MATH 280
MATH 465	Ordinary Differential Equations	3-0-3	MATH 202, MATH 280
MATH 470	Partial Differential Equations	3-0-3	MATH 301
MATH 471	Numerical Analysis I	3-0-3	MATH 280, MATH 321, or SE 301
MATH 472	Numerical Analysis II	3-0-3	MATH 321, SE 301
MATH 480	Linear & Nonlinear Prog.	3-0-3	MATH 280, ICS 101, ICS 102, ICS 103
MIS 301	Business Systems Analysis & Design I	3-0-3	MIS 215 or Dept Approval
MIS 401	Business Systems Analysis & Design II	3-0-3	MIS 301
MIS 490	Information Resources Management	3-0-3	MIS 401, COE 353, SS
PETE 343	Special Topics on Petroleum Statistical Analysis	2-0-2	SE 301
PETE 402	Reservoir Simulation	3-0-3	PETE 301, SE 301
PHYS 201	General Physics III	3-3-4	PHYS 102, MATH 102
PHYS 211	Optics	2-3-3	PHYS 102
PHYS 212	Modern Physics	3-3-4	PHYS 102
PHYS 301	Classical Mechanics I	3-0-3	PHYS 101, MATH 202
PHYS 302	Classical Mechanics II	3-0-3	PHYS 301
PHYS 303	Experimental Physics I	2-3-3	PHYS 201 or PHYS 212
PHYS 304	Experimental Physics II	1-3-2	PHYS 303
PHYS 373	Introduction to Computational Physics	2-3-3	PHYS 212 or PHYS 201, ICS 101
SE 301	Numerical Methods	3-0-3	ICS 101, MATH 201

SE 303	Operations Research I	3-3-4	SE 201, SE 205, or STAT 319
SE 305	Optimization Methods	2-3-3	SE 301, Co. SE 303
SE 312	Instrumentation	2-3-3	EE 203
SE 320	Quality Control and Industrial Statistics	3-0-3	SE 205 or STAT 319, Co. SE 325
SE 325	Engineering Statistics	3-0-3	SE 205
SE 405	Stochastic Systems Simulation	2-3-3	SE 205 or STAT 319
SE 421	Operations Research II	3-0-3	SE 303
SE 438	Instrumentation for Process Control	2-3-3	SE 312
STAT 320	Statistical Quality Control	3-0-3	STAT 319 or STAT 201
STAT 355	Demographic Methods	3-0-3	STAT 201
STAT 361	Operations Research I	3-0-3	STAT 201 or Equivalent
STAT 365	Data Collection & Sampling Methods	3-0-3	STAT 201
STAT 411	Mathematical Statistics I	3-0-3	STAT 315
STAT 412	Mathematical Statistics II	3-0-3	STAT 411
STAT 415	Stochastic Processes	3-0-3	STAT 301
STAT 430	Experimental Design	3-0-3	STAT 302
STAT 460	Time Series	3-0-3	STAT 301
STAT 461	Operations Research II	3-0-3	STAT 361, STAT 301

Catalog Description of COE Courses

COE 200 Fundamentals of Computer Engineering (3-3-4)

Introduction to Computer Engineering. Binary number systems. Digital circuits. Boolean algebra and switching theory. Manipulation and minimization of Boolean functions. Combinational circuit analysis and design, multiplexers, decoders, adders. Sequential circuit analysis and design, basic flip-flops, clocking, and edge-triggering, registers, counters, timing sequences, state assignment and reduction techniques. Register transfer level operations. Machine level programming.

Prerequisite: PHYS 102.

COE 205 Computer Organization and Assembly Language (3-3-4)

Introduction to computer organization. Octal and hexadecimal number systems, ASCII codes. Assembly language programming, instruction formats and types, memory and I/O instructions, arithmetic instructions, addressing modes, stack operations, and interrupts. ALU design. RTL, microprogramming, and hardwired control design. Practice of assembly language programming.

Prerequisite: COE 200 & ICS 201.
NOTE: COE 205 is equivalent to ICS 232. Students can take credit for only one of them.

COE 305 Microcomputer System Design (3-3-4)

Microprocessor architecture and organization. Bus types, architecture, and buffering techniques. Memory and I/O subsystems, organization, timing and interfacing. Peripheral controllers and programming. Practice on the design of a microprocessor system, testing, debugging, and reporting.

Prerequisite: COE 205.

COE 307 Computer Hardware (3-0-3)

Digital computers and digital systems, binary systems, number systems, base conversion and binary codes. Basic logic elements, Boolean algebra, and manipulation of Boolean functions. Flip-flops, clocking, and registers. Computer organization, CPU, ALU, main memory, and I/O devices.

Prerequisite: Junior standing.
NOTE: This course is NOT open for COE students. It cannot be taken for credit with COE200.

COE 308 Computer Architecture (3-0-3)

Memory hierarchy and cache memory. Integer and floating point arithmetic. Instruction and arithmetic pipelining, superscalar architecture. Reduced Instruction Set Computers. Parallel architectures and interconnection networks.

Prerequisite: COE 205.

COE 342 Data and Computer Communications (3-0-3)

Introduction to data communication. Overview of the OSI model. Frequency response, bandwidth, filtering and noise. Fourier series and Fourier transform. Information theory concepts: Nyquist's theorem, Shannon's and Sampling theorems. Analog and digital modulation techniques. Pulse Code Modulation (PCM). Communication systems circuits and devices. Data encoding. Physical layer protocols. Data link control (point to point communication, design issues, link management, error control, flow control). Multiplexing and switching.

Corequisite: STAT 319.

COE 350 Cooperative Assignment **(0-0-0)**

The starting of the cooperative work in the summer just preceding the senior year. Description as given in COE 351.

Prerequisite: ENGL 214 and the completion of 90 credit hours + Department requirements.

COE 351 COE Cooperative Work **(0-0-9)**

A continuous period of 28 weeks spent in industry with the purpose of acquiring practical experience in different areas of Computer Engineering. During this period, a student is exposed to the profession of Computer Engineering by working in the field. Students are required to submit a final report and give a presentation about their experience and the knowledge they gained during their cooperative work.

Prerequisite: COE 350 if registering in the Fall semester.
ENGL 214 + Completion of 90 Credits + Department requirements if registering in Spring semester.

COE 352 End Cooperative Work **(0-0-0)**

This course is the same as COE 350. The only difference is that COE 352 must be taken by students who start their co-op program during the second term of the academic year.

Prerequisite: COE 351

COE 353 Fundamentals of Computer Communications **(3-0-3)**

Digital communications fundamentals. Voice and data transmission equipment. Communications channels. Data coding and modulation. Multiplexing. Modems. Transmission media. Data transmission codes and protocols. Software packages. Data networks. Planning and design of communication networks.

Prerequisite: Junior standing.
Note: This course is NOT open for COE students. It cannot be taken for credit with COE 342.

COE 360 Principles of VLSI Design **(3-0-3)**

MOS transistor operation and limitations. MOS digital logic circuits (NMOS and CMOS), static, dynamic and sequential MOS logic. IC fabrication and processing. Layout and mask generation. IC design and verification tools. Applications and case studies.

Prerequisite: EE 203.

COE 385 Personal Computers **(2-3-3)**

Overview of system features and components. Microprocessor types and specifications. Motherboards, bus slots and I/O cards, memory, power supply, input devices, video display hardware, and audio hardware. Floppy disk, hard disk, and CD-ROM drives and controllers. Network cards. Preventive maintenance, backups, and warranties. Software and hardware diagnostic tools. Software and hardware troubleshooting. Applications.

Prerequisite: Junior standing.
Note: This course is NOT open for COE students.

COE 390 Seminar **(1-0-1)**

The purpose of this course is to help improve students' ability for presenting their technical work. In addition, the course emphasizes the various social and ethical responsibilities of the computing professional. It teaches students about the nature of engineering as a profession, codes of professional conduct, ethics & responsibility, and the role of professional societies. Case studies of conflict between engineering professional ethical values and external demands. The course features students participation in discussions held by faculty members and invited guests.

Prerequisite: Junior standing.

COE 399 Summer Training **(0-0-0)**

The aim of the summer training is to provide students with direct on-the-job experience working with professionals in the field. This training provides an opportunity to expose students to the reality of professional practice. Students are required to submit a report and make a presentation on their summer training experience and the knowledge gained.

Prerequisite: ENGL 214, junior standing, and approval of the department.

COE 400 Digital system Design **(1-6-3)**

The purpose of this course is to integrate student's knowledge of hardware and software in the design, implementation, debugging, and documentation of one major system. The twin learning experience of making hardware versus software decisions, and participating in a structured design are integrated into the same design exercise. Contrary to COE 485, this is a structured course whereby students are trained by the course instructor to work in teams in implementing a number of mini projects in addition to one major common project at the end of the course.

Prerequisite: COE 305 and senior standing.

COE 402 Computer System Performance Evaluation **(3-0-3)**

Introduction to computer system performance analysis and evaluation. Review of basic probability distributions and basic concepts of statistics. Performance measures and measurement techniques. Performance analysis, performance prediction, asymptotic bounds on performance. Simulation and modeling of computer systems. Experimental and analytical approaches. Introduction to queuing network modeling. Case studies.

Prerequisite: STAT 319 or consent of instructor.

COE 403 Advanced Microprocessor Architecture **(3-0-3)**

Introduction to advanced microprocessor architectures. Classification, data types, memory allocation in high level languages, addressing modes, and instructions. Register organization, floating point arithmetic, and interrupts. Memory management: virtual and physical memories, hierarchy, segmentation, and paging. Study of advanced microprocessor architectures. Multi-microprocessors: single and shared buses and arbiters.

Prerequisite: COE 305.

COE 405 Design and Modeling of Digital Systems (3-0-3)

Design methodology. Hardware modeling basics. Modeling concurrency and timing aspects. Behavioral, structural, and data flow level modeling using hardware description languages (HDLs). System level modeling and design of practical processors, controllers, arithmetic units, etc. Translation of instruction sets to hardware models for software emulation. Case studies.

Prerequisite: COE 308 or consent of instructor.

COE 406 RISC Architectures (3-0-3)

Principles of RISC design methodologies. Designing an instruction set from a RISC perspective. Optimized register usage. RISC compilers. RISC assessment. A general purpose RISC processor example. An application oriented RISC processor example. Future directions.

Prerequisite: COE 308.

COE 409 Special Topics in Comp. Arch. & Dig. Sys. Design (3-0-3)

Special topics in issues related to computer architecture and digital systems design. Topics and specifics will be announced well before the course starting date.

Prerequisite: COE 308.

COE 410 Design of Sequential Systems (3-0-3)

Finite state machines, state minimization and assignment, extended state tables. ASM charts, RT level modeling. Use of programmable logic devices in digital design and synthesis (PLAs, PLDs, FPGAs). Design and analysis of asynchronous logic: level mode sequential circuits, analysis and design of fundamental mode circuits, reduction of state and flow tables, races, cycles, race-free assignment, and hazards.

Prerequisite: COE 200.

COE 420 Parallel Computing (3-0-3)

Introduction to parallel computing. Parallel architectures, MIMD, SIMD, interconnection topologies. Performance measures, speedup, efficiency, limitations of parallel processing. Parallel programming paradigms, shared memory, message passing, data parallel, data flow. Parallelizing compiler techniques, code and data partitioning, vectorization. Parallel programming environments and tools. Parallel algorithms examples.

Prerequisite: COE 308.

COE 421 Fault-Tolerant Computing (3-0-3)

Introduction to fault-tolerant computing (FTC). Goals of fault tolerance (FT). Design techniques to achieve FT. Evaluation of FT systems. Reliability modeling and analysis of FT systems. Availability modeling. Design of practical FT systems. Design of FT VLSI circuits. Introduction to testing.

Prerequisite: COE 308.

COE 422 Real Time Systems (3-0-3)

Fundamentals of real time systems design; scheduling, interrupts, process communication and synchronization. Design of real time systems. Decomposition of real time systems. Applications of real time systems. Instrumentation for real time applications. Real time operating systems. Case studies.

Prerequisite: COE 305.

COE 423 Distributed Systems (3-0-3)

Characterization of distributed systems, interprocess communication, client-server, remote procedure calls, logical and physical time, distributed coordination. File services, naming and directory services, distributed concurrency control, transactions and atomic commit problem. Case studies.

Prerequisite: Senior standing.

COE 429 Special Topics in Parallel and Distributed Systems (3-0-3)

Special topics in issues related to parallel and distributed systems. Topics and specifics will be announced well before the course starting date.

Prerequisite: Senior standing.

COE 441 Local Area Networks (3-0-3)

Introduction to Local Area Networks (LANs). Classes of LANs. LAN design issues. LAN topologies. LAN transmission media. LAN protocols: Medium Access Control (MAC) and Logic Link Control (LLC). LAN standards. Network software: Network operating systems. LAN performance modeling and analysis. Internetworking: Bridges, Routers, and Gateways. Reliability, availability, survivability, and security.

Prerequisite: COE 342 or consent of instructor.

COE 442 Computer Networks (3-3-4)

Introduction to computer networks. Circuits, message, packet, and cell switching. The OSI model. WAN and LAN design issues. LAN standards. Network layer design issues. Routing and congestion control. Internetworking. ISDN, B-ISDN, and ATM. Transport layer design issues and protocols. Application layer design issues and protocols. Examples of protocol suites and networks.

Prerequisite: COE 342 or consent of instructor. This course cannot be taken for credit with ICS 432.

COE 443 High Speed Networks (3-0-3)

Introduction to computer communication networks. Introduction to high speed networking. Impact of high speed on communication protocols. Design and performance issues of high speed networks. Standard high speed protocols and networks. Examples of high speed networks. Case studies. Future directions.

Prerequisite: COE 342 or consent of instructor.

COE 444 Internetwork Design and Management (3-0-3)

Types of computer networks. Principles of internetworking. The network development life cycle. Network analysis and design methodology. Internetworking hardware. Connectionless internetworking. Connection-oriented internetworking. Routing strategies. Structured wiring and backbone design. OSI internetworking. Network management (SNMP). Network security and firewalls. Network administration. Case studies.

Prerequisite: COE 342 or consent of instructor.

COE 445 Internet Information Services (3-0-3)

Electronic mail and file transfer. Information retrieval services and tools. Multimedia applications: Computer Supported Cooperative Work (CSCW); audio-video conferencing; networked hypertext and hypermedia; visual cyberspace; networking requirements of multimedia applications. World Wide Web (WWW) page and program development. The HyperText Markup Languages and the HyperText Transfer Protocols. Common Gateway Interfaces, Java and Java Script language. Web page style and design.

Prerequisite: Senior standing.

COE 446 Mobile Computing (3-0-3)

Introduction to mobile computing. Designing computer networks to support user mobility. Models for indoor and outdoor mobile networks. System issues such as performance, quality of service, reliability, and security in mobile computing environment. Hardware, and access protocols, for mobile networks. Adapting existing protocols to support mobility.

Prerequisite: Senior standing.

COE 449 Special Topics in Computer Communications and Networking (3-0-3)

Special topics in issues related to computer communication networks. Topics and specifics will be announced well before the course starting date.

Prerequisite: COE 342 or consent of instructor.

COE 460 Advanced Digital Electronics (3-0-3)

Sub-micron CMOS technology. BiCMOS process technology, device design considerations, device modeling, BiCMOS digital integrated circuits, BiCMOS digital circuit applications. GaAs process technology, device design, and digital logic design. Comparison between CMOS, BiCMOS, and GaAs performance. Future trends.

Prerequisite: COE 360

COE 462 Design Automation of VLSI Circuits (3-0-3)

Introduction to computer-aided design of integrated circuits. Design approaches, design steps and corresponding design automation problems and tools. Logical and physical partitioning. Solution techniques for floorplanning, placement, global routing and detailed routing. Strategies for grid and channel routing. Layout generation problem and solutions. Symbolic layout, layout editors and compaction. Silicon compilation.

Corequisite: COE 360 or consent of instructor.

COE 464 Testing of Digital Circuits (3-0-3)

Introduction to the testing problem, fault modeling, e.g., stuck-at, bridging, transistor-open and transistor-short faults. Fault simulation, gate-level testing, automatic test pattern generation (ATPG) algorithms. Testing of regular structures. Testing of sequential circuits. Signature analysis. Design-for-testability (DFT).

Prerequisite: Senior standing.

COE 465 VLSI System Design Methodology (3-0-3)

VLSI MOS system design. Layout and design rules, layout graphic editors, design rule checking, layout extraction and verification (LVS). Full custom versus semicustom design styles. Design entry tools, schematic capture and HDLs. Logic and switch level simulation. Static timing analysis concepts and tools. Concepts and tools in floorplanning, placement and routing, layout generation and design synthesis. The course stresses hands-on experience of VLSI design using CAD tools.

Prerequisite: COE 360.

COE 469 Special Topics in VLSI and Design Automation (3-0-3)

Special topics in issues related to the VLSI technology. Topics and specifics will be announced well before the course starting date.

Prerequisite: COE 360.

COE 484 Introduction to Robotics (3-0-3)

Introduction to Robotics. Motion coordination, configuration space and task space. Mathematical operators, direct and inverse geometric method, direct and inverse variational method. Robot programming, effector-level and object-level, and applications. Practice of robot programming. Introduction to sensors systems and robotics vision. Architectural aspects of robotics systems.

Prerequisite: Senior standing.

COE 485 Senior Design Project (1-6-3)

This course is designed to give students the experience of tackling a realistic engineering problem. The intent is to show how to put theoretical knowledge gained into practical use by starting from a word description of a problem and proceeding through various design phases to end up with a practical engineering solution. Various projects are offered by COE faculty in their respective specialization areas. The project advisor guides the student in conducting feasibility study, preparation of specifications, and the methodology for the design. Detailed design and implementation of the project are carried out followed by testing, debugging, and documentation. An oral presentation and a final report are given at the end of the semester.

Prerequisite: Senior standing.

COE 487 Computer Vision Processing (3-0-3)

Introduction to vision processing. Illumination and imaging techniques. Planar and stereo-vision, pixel representation, preprocessing, smoothing, enhancement, and equalization. Edge detection, gradient, Laplacian, and thresholding. Segmentation, linear, polygonal, and Fourier descriptors. Introduction to 3D structures. Shape matching, search approaches, interpretation, and recognition.

Prerequisite: Senior standing.

COE 488 Data Acquisition Interfacing (3-0-3)

Data acquisition systems, basic sampling concepts, data collection fundamentals. Interfaces. Special instruments. IEEE 488 standard. RS 232C data acquisition software technique. I/O operation queuing. Hardware for data acquisition systems. Multibus. VME bus. Examples and designs.

Prerequisite: COE 305.

COE 499 Special Topics in Computer Engineering (3-0-3)

Special topics in issues related to computer engineering. Topics and specifics will be announced well before the course starting date.

Prerequisite: Senior standing.

List of All courses in the COE program

Course #	Course title	Status*	Credits
COE 200	Fundamentals of Computer Engg.	R	(3-3-4)
COE 205	Computer Org. and Assembly Language	R	(3-3-4)
COE 305	Microcomputer System Design	R	(3-3-4)
COE 307	Computer Hardware	S	(3-0-3)
COE 308	Computer Architecture	R	(3-0-3)
COE 342	Data and Computer Communications	R	(3-0-3)
COE 350	Cooperative Work	R	(0-0-0)
COE 351/352	Cooperative Work (Continued)	R	(0-0-9)
COE 353	Fundamentals of Computer Communications	S	(3-0-3)
COE 360	Principles of VLSI Design	R	(3-0-3)
COE 385	Personal Computers	S	(2-3-3)
COE 390	Seminar	R	(1-0-1)
COE 399	Summer Training	R	(0-0-0)
COE 400	Digital system Design	R	(1-6-3)
COE 402	Computer Sys. Performance Evaluation	E	(3-0-3)
COE 403	Advanced Microprocessor Architecture	E	(3-0-3)
COE 405	Design and Modeling of Digital Systems	E	(3-0-3)
COE 406	RISC Architectures	E	(3-0-3)
COE 409	Special Topics in Comp. Arch. & Dig. Sys. Design	E	(3-0-3)
COE 410	Design of Sequential Systems	E	(3-0-3)
COE 420	Parallel Computing	E	(3-0-3)
COE 421	Fault-Tolerant Computing	E	(3-0-3)
COE 422	Real Time Systems	E	(3-0-3)
COE 423	Distributed Systems	E	(3-0-3)
COE 429	Special Topics in Parallel and Distributed Systems	E	(3-0-3)
COE 441	Local Area Networks	E	(3-0-3)
COE 442	Computer Networks	R	(3-3-4)
COE 443	High Speed Networks	E	(3-0-3)
COE 444	Internetwork Design and Management	E	(3-0-3)
COE 445	Internet Information Services	E	(3-0-3)
COE 446	Mobile Computing	E	(3-0-3)
COE 449	Special Topics in Computer Comm. & Net	E	(3-0-3)
COE 460	Advanced Digital Electronics	E	(3-0-3)
COE 462	Design Automation of VLSI Circuits	E	(3-0-3)
COE 464	Testing of Digital Circuits	E	(3-0-3)
COE 465	VLSI System Design Methodology	E	(3-0-3)
COE 469	Special Topics in VLSI	E	(3-0-3)
COE 484	Introduction to Robotics	E	(3-0-3)
COE 485	Senior Design Project	R	(1-6-3)
COE 487	Computer Vision Processing	E	(3-0-3)
COE 488	Data Acquisition Interfacing	E	(3-0-3)
COE 499	Special Topics in Computer Engineering	E	(3-0-3)

* R: Required E: Elective S: Service

Course correspondence between the Old Program and the New Program in COE

Old Program	R/E*	New Program	R/E*
COE 201 Digital Logic I (3-3-4)	R	COE 200 Fundamentals of Computer Engg. (3-3-4)	R
COE 301 Computer Architecture I (3-0-3)	R		
COE 303 Digital Logic II (2-3-3)	R	COE 410 Design of Sequential Systems (3-0-3)	E
COE 332 Data Comm. for Business (3-0-3)		COE 353 Fundamentals of Comp Comm. (3-0-3)	
COE 333 Comp. Hardware and Arch. (3-0-3)		COE 307 Computer Hardware (3-0-3)	
COE 342 Data Communications (3-0-3)	R	COE 342 Data & Computer Comm. (3-0-3)	R
COE 352 Microprocessor-Based Syst. (3-3-4)	R	COE 305 Microcomputer System Design (3-3-4)	R
COE 399 Summer Training (3-0-3)	R	COE 399 Summer Training (3-0-3)	R
COE 401 Computer Architecture II (3-0-3)	R	COE 308 Computer Architecture (3-0-3)	R
COE 411& COE 412 Senior Projects I & II	R	COE 485 Senior Design Project (1-6-3)	R
COE 451 Semiconductor Devices (3-0-3)	R	COE 360 Principles of VLSI Design (3-0-3)	R
COE 452 Computer Networks (3-0-3)	R	COE 442 Computer Networks (3-3-4)	R
COE 454 Digital System Design (1-6-3)	R	COE 400 Digital system Design (1-6-3)	R
COE 462 Digital Design Automation (3-0-3)	E	COE 462 Design Autom. of VLSI Circuits (3-0-3)	E
COE 463 Digital Robotics (3-0-3)	E	COE 484 Introduction to Robotics (3-0-3)	E
COE 465 VLSI System Design (3-0-3)	E	COE 465 VLSI System Design Methodology (3-0-3)	E
COE 466 Fault-Tolerant Computing (3-0-3)	E	COE 421 Fault-Tolerant Computing (3-0-3)	E
COE 470 Local Networks (3-0-3)	E	COE 441 Local Area Networks (3-0-3)	E
COE 480 Adv. Microprocessor Archit. (3-0-3)	E	COE 403 Advanced Microprocessor Arch. (3-0-3)	E
COE 482 Data Acquisition Interfacing (3-0-3)	E	COE 488 Data Acquisition Interfacing (3-0-3)	E
COE 483 VLSI RISC Architecture (3-0-3)	E	COE 406 RISC Architectures (3-0-3)	E
ICS 101 Computer Programming (2-3-3)	R	ICS 102 Introduction to Computing (2-3-3)	R
ICS 201 Introduction to Comp. Science	R	ICS 201 Introduction to Computer Science(3-3-4)	R
ICS 202 Data Structures (3-0-3)	R	ICS 202 Data Structures (3-3-4)	R
ICS 203 Discrete Structures (3-0-3)	R	ICS 252 Discrete Structures (3-0-3)	R
ICS 212 Comp. Org. & Assemb. Lang. (3-3-4)	R	COE 205 Comp. Organization and Assembly (3-3-4)	R
ICS 301 Systems Software (3-3-4)	R		
ICS 354 Automata & Formal Langs. (3-0-3)	R		
EE 201 Electric Circuits (3-3-4)	R	EE 201 Electric Circuits (3-3-4)	R
EE 202 Network theory (3-3-4)	R		
EE 203 Electronics I (3-3-4)	R	EE 203 Electronics I (3-3-4)	R
STAT 315 Probability and Statistics (3-0-3)	R	STAT 319 Probability and Stat. For Engg&Sc. (2-3-3)	R
COE 490 Special Topics (3-0-3)	E	COE 499 Special Topics in Computer Engg. (3-0-3)	E

Course correspondence between the New Program and the old Program in ICS

New Program				Old Program		
1.	ICS 101	Computer Programming.	(2-3-3)	ICS 101	Computer Programming.	(1-3-2)
2.	ICS 102	Intro. to Computing	(2-3-3)	ICS 101	Computer Programming	(2-3-3)
3.	ICS 201	Intro. to Comp. Sc.	(3-3-4)	ICS 201	Intro. to Comp. Sc. (Pascal)	(3-3-4)
4.	ICS 202	Data Structures	(3-3-4)	ICS 202	Data Structures	(3-0-3)
5.	ICS 232	Comp. Org. & Assem. Prog.	(3-3-4)	ICS 212	Comp. Org. & Assem. Prog.	(3-0-3)
6.	ICS 251	Found. Of Comp. Sc.	(3-0-3)	ICS 242	Mathematical Logic	(3-0-3)
7.	ICS 252	Discrete Structures	(3-0-3)	ICS 203	Discrete Structures	(3-0-3)
8.	ICS 313	Fundem. of Prog. Lang.	(3-0-3)	ICS 352	Design & Impl. Of Prog. Lang	(3-0-3)
9.	ICS 314	Object-Oriented Prog.	(3-0-3)			
10.	ICS 331	System Software	(3-0-3)	ICS 301	System Software	(3-3-4)
11.	ICS 333	File Processing	(3-0-3)	ICS 311	File Processing	(3-0-3)
12.	ICS 334	Database Systems	(3-3-4)	ICS 411	Database Systems	(3-0-3)
13.	ICS 353	Design & Ana of Algo	(3-0-3)	ICS 406	Design & Anal. Of Alg.	(3-0-3)
14.	ICS 354	Automata & Lang Tran Sys	(3-0-3)	ICS 354	Automata. & Formal Lang.	(3-0-3)
15.	ICS 381	Int. to Artificial Intelligence	(3-0-3)	ICS 445	Artificial Intelligence	(3-3-4)
16.	ICS 412	Compiler Construction	(3-0-3)	ICS 403	Compiler Construction	(3-0-3)
17.	ICS 413	Software Engineering	(3-3-4)	ICS 465	Principles of S/W Eng.	(3-0-3)
18.	ICS 431	Operating Systems	(3-3-4)	ICS 401	Operating Systems	(3-0-3)
19.	ICS 432	Computer Network Systems	(3-3-4)			
20.	ICS 434	Advanced Database Systems	(3-0-3)	ICS 470	Advanced Database Systems	(3-0-3)
21.	ICS 435	Computer Graphics	(3-0-3)	ICS 435	Computer Graphics	(3-0-3)
22.	ICS 411	Senior Project	(1-6-3)	ICS 441 + ICS 442		(0-3-1) - (0-6-3)
23.	ICS 452	Theory of Computing	(3-0-3)	ICS 404	Theory of Computing	(3-0-3)
24.	ICS 471	Parallel &Distributed Processing	(3-0-3)	ICS 451	Distributed Processing	(3-0-3)
25.	ICS 481	Neural Networks	(3-0-3)			
26.	ICS 482	Natural Lang. Understan.	(3-0-3)	ICS 485	Natural Language Understg..	(3-0-3)
27.	ICS 483	Computer Vision	(3-0-3)	ICS 480	Computer Vision	(3-0-3)
28.	ICS 484	Arabization of Computers	(3-0-3)			
29.	ICS 485	Knowledge Based Systems	(3-0-3)			
30.	ICS 490	Special Topics	(3-0-3)	ICS 490	Special Topics	(3-0-3)
31.	ICS 491	Special Topics II	(3-0-3)	ICS 491	Special Topics II	(3-0-3)

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