Menoufiya University
Faculty of Electronic Engineering

Postgraduate Constitution
(Credit Hours System)

Faculty of Electronic Engineering
Menoufiya University

2009

Introduction:

The Faculty of Electronic Engineering is a member of Menoufya University.
The Faculty has three major departments in the fields of:

1- Electronics and Electrical Communications Engineering.
2- Computer and Science Engineering
3- Industrial Electronics and Control Engineering.

In addition to the department of Physics and Engineering Mathematics that prepare students in the fundamentals of science and mathematics.

The Faculty mission

The mission of the Faculty of Electronic Engineering is to provide the society with competent graduates who can deal with modern technologies and their applications in the fields of Electronics and Electrical Communications Engineering, Computer Science and Engineering, Industrial Electronic and Control Engineering according to national and international quality standards, providing them with basic knowledge and skills with complete conscious by environment problems, in addition to a commitment by occupation moralities.

The Faculty offers modernized teaching and learning methodologies adapted to the needs of the society. One of the goals is to prepare graduates for the world of work.

It aims at developing critical thinking, lifelong learning, and training skills to attain high personal and professional goals. It also provides post graduate programs, research and engineering consultancy to serve the requirement of the society.

For the achievement of the Faculty mission in education and research, the Faculty offers suitable programs for undergraduate and postgraduate students. These programs are well prepared and continually updated according to the continuous developing in the fields of technology, programs, and scientific research. In addition the prospects offer many selected advanced topics in each program. These topics are ready to be updated yearly.

To ensure the accreditation for this program nationally and international, the program is prepared in terms of credit hour system. The recent postgraduate

program has a great flexibility and gives the student the rights to mange the study time and to choose some of the desired selected topics.

The constitution includes for chapters and six appendices. These are arranged as follows:
Chapter 1: General roles
Chapter 2: Postgraduate Diplomas
Chapter 3: Master of Science in Electronic Engineering
Chapter 4: Doctor of Philosophy in Electronic Engineering
And the six appendices contain the study courses for each major and degree.

Programs study time and number of credit hours:
The study year is divided into three semesters. These are 1st, 2nd, and summer terms. The 1st, and 2nd semesters are 15 weeks, but the summer one is 8 weeks.
The maximum load per semester is 18 credit hours, and the minimum is 6. In summer the load hours are only 9.

Postgraduate Diplomas:
The student has to pass successfully 12 courses equivalent to 36 credit hours.

Master of Science in Electronic Engineering:
Maximum study time is 4-years from registering time. The number of credits is 36 hours, 18 for courses, and 18 for writing and admitting thesis.

Doctor of Philosophy in Electronic Engineering:
Maximum study time is 5-years from the time of degree registration. The number of credits is 48 hours, 18 for courses, and 30 for writing and admitting thesis. The student has no permission to admit final oral test before passing all courses successfully.

The program Objectives:
The objectives are definite and rely on the program content and the Degree of each program.

Postgraduate Diplomas:
Aims to raise the scientific efficiency in applied fields for minor specifications in electronic engineering. This is achieved through studying some applied courses and participating in small teams work to prepare applied projects.

Master of Science in Electronic Engineering:

Aims to develop the research capabilities, scientific thinking, and developing in the subject of the research field. This can be done using recent scientific methodologies. An applied and academic research is compulsory ended by the successful admission of thesis.

Doctor of Philosophy in Electronic Engineering:

Aims at developing the independency, and the ability of innovation. This leads to adding contributions in the subject and field of specification.

Appendices

page

- Course Descriptions of Master Degree in Science Engineering

APPENDIX (1)

COURSES OF POSTGRADUATE DIPLOMAS (LEVEL- 500)

APPENDIX (1.1)

Diplomas in the Department of Electronics and Electrical Communications Engineering

1) Diploma in Communication Engineering

The student must complete the 27 credit hours of the following courses.

EEC501-EEC502-EEC503-EEC504-EEC505-EEC506-EEC507-EEC508-EEC599

The student chooses the 9 credit hours from the following courses.

EEC509- EEC510-EEC511-EEC512-EEC513-EEC514

2) Diploma in Antenna and microwave Wave Engineering

The student must complete the 27 credit hours of the following courses.

EEC501-EEC510-EEC515-EEC516-EEC517-EEC518-EEC519-EEC520-EEC599

The student chooses the 9 credit hours from the following courses.

EEC502-EEC511-EEC512-EEC514-EEC521-EEC522

3) Diploma in Microelectronics Engineering

The student must complete the 27 credit hours of the following courses.

EEC501-EEC513-EEC523-EEC524-EEC525-EEC526-EEC527-EEC528-EEC599

The student chooses the 9 credit hours from the following courses.

EEC503-EEC512-EEC515-EEC517-EEC529-EEC530

4) Diploma in Broadcasting and Acoustic Engineering

The student must complete the 27 credit hours of the following courses.

EEC501-EEC508-EEC510-EEC511-EEC530-EEC531-EEC532-EEC33-EEC599

The student chooses the 9 credit hours from the following courses.

EEC503-EEC505-EEC512-EEC514-EEC534-EEC535

5) Diploma in Nano-technology Engineering

The student must complete the 27 credit hours of the following courses.

EEC501-EEC524-EEC536-EEC537-EEC538-EEC539-EEC540-EEC541-EEC599

The student chooses the 9 credit hours from the following courses.

EEC512-EEC513-EEC517-EEC521-EEC525-EEC530

Courses of Postgraduate Diplomas in Electronics and Electrical Communication Engineering

No.	Code	Courses	Credit Hours	Exam Hours	Pre-requisite
1	EEC 501	Applied Mathematics	3	3	
2	EEC 502	Mobile Communications	3	3	
3	EEC 503	Communications Circuits	3	3	
4	EEC 504	Digital Communication Systems	3	3	
5	EEC 505	Statistical Communications and Information Theory	3	3	
6	EEC 506	Computer Networks	3	3	
7	EEC 507	Optical Communication Systems	3	3	
8	EEC 508	Satellite Communication Systems	3	3	
9	EEC 509	Network Planning	3	3	
10	EEC 510	Antennas and Wave Propagation	3	3	
11	EEC 511	Signal Processing and Applications	3	3	
12	EEC 512	Neural Networks and Applications	3	3	
13	EEC 513	Microprocessor and Applications	3	3	
14	EEC 514	Radar and Sonar Systems	3	3	
15	EEC 515	Advanced Electromagnetic Field Theory	3	3	
16	EEC 516	Design of Microwave Circuits	3	3	
17	EEC 517	Microwave Electronics	3	3	
18	EEC 518	Microwave Measurements	3	3	
19	EEC 519	Antenna Arrays Theory	3	3	EEC 510
20	EEC 520	Numerical Methods for Electromagnetic Fields	3	3	EEC 510 and EEC 515

21	EEC 521	Electro-Optics and Lasers	3	3	
22	EEC 522	Wave Propagation in Biological Media	3	3	EEC 510
23	EEC 523	Solid State Electronics	3	3	
24	EEC 524	Quantum Mechanics and Optical Electronics	3	3	
25	EEC 525	Integrated Circuits and Applications	3	3	
26	EEC 526	VLSI and Applications	3	3	EEC 525
27	EEC 527	Optical and Optoelectronic Devices	3	3	
28	EEC 528	Super-Conductor components and Applications	3	3	
29	EEC 529	Introduction to Biomedical Electronics	3	3	
30	EEC 530	Acoustic Devices and Applications	3	3	
31	EEC 531	Acoustics and Ultrasonics	3	3	
32	EEC 532	Television Engineering	3	3	
33	EEC 533	Room Acoustics	3	3	EEC 531
34	EEC 534	Speech Recognition	3	3	
35	EEC 535	Under Water Acoustics	3	3	EEC 531
36	EEC 536	Nanomatrial and nanostructure fabrication	3	3	
37	EEC 537	Optical properties of Nanocrystal	3	3	
38	EEC 538	Luminescent nanomaterials	3	3	
39	EEC 539	Devices based on nanostructures	3	3	
40	EEC 540	Theoretical models for nanocrystals	3	3	
41	EEC 541	Modern Spectroscopy	3	3	
42	EEC 599	Project	3	Discus sion	

APPENDIX (1.2)

Diplomas in the Department of Industrial Electronics and Control Engineering

1) Diploma in Automatic and Systems Engineering

The student must complete the 12 credit hours of the following courses.
ACD 500-ACD501-ACD502-ACD 599

The student chooses 24 credit hours from the following courses.
ACD 510- ACD 511- ACD 512- ACD 513- ACD 514- ACD 515- ACD 516- ACD 517- ACD 518 - ACD 519

2) Diploma in Industrial Electronics and Measurements Engineering

The student must complete the 12 credit hours of the following courses.
ACD 500- ACD 501- ACD 502- ACD 599

The student chooses 24 credit hours from the following courses.
ACD 520- ACD 521- ACD 522- ACD 523- ACD 524- ACD 525- ACD 526- ACD 527- ACD 528 - ACD 529

3) Diploma in Mechatronics and Robotics Engineering

The student must complete the 12 credit hours of the following courses.
ACD 500- ACD 501- ACD 502- ACD 599

The student chooses 24 credit hours from the following courses.
ACD 521- ACD 523- ACD 529- ACD 530- ACD 531- ACD 532- ACD 533- ACD 534- ACD 535 - ACD 536

Courses of Postgraduate Diplomas in Industrial Electronics and Control Engineering

No.	Code	Courses	Credit Hours	Exam Hours	Pre-requisite
1	ACD 500	Engineering Mathematics	3	3	
2	ACD 501	Advanced Programming and Algorithms	3	3	
3	ACD 502	Digital Signal Processing and systems	3	3	
4	ACD 510	Control System analysis	3	3	
5	ACD 511	System identification	3	3	ACD 502
6	ACD 512	System Modeling and Simulation	3	3	
7	ACD 513	Digital Control Systems	3	3	ACD 502
8	ACD 514	Process Control	3	3	
9	ACD 515	Control System Troubleshooting	3	3	
10	ACD 516	Modern control	3	3	
11	ACD 517	Adaptive Control Systems	3	3	ACD 511
12	ACD 518	Nonlinear systems	3	3	
13	ACD 519	Selected topic in Automatic Control	3	3	
14	ACD 520	Industrial Measurement	3	3	
15	ACD 521	Artificial intelligence and Expert Systems	3	3	
16	ACD 522	Quality Control	3	3	
17	ACD 523	Logic controllers & PLC	3	3	
18	ACD 524	Power electronics	3	3	
19	ACD 525	Industrial Electronics applications	3	3	
20	ACD 526	Classical controllers	3	3	ACD 510
21	ACD 527	Motor Control Troubleshooting	3	3	
22	ACD 528	Selected topic in Industrial electronics	3	3	
23	ACD 529	Microcontrollers	3	3	
24	ACD 530	Advanced Interfacing & networking	3	3	
25	ACD 531	Data communications	3	3	
26	ACD 532	Robotics	3	3	
27	ACD 533	Mechatronics	3	3	
28	ACD 534	Selected topic in mechatronics	3	3	
29	ACD 535	Selected topic in robotics	3	3	
30	ACD 536	Fluid Mechanics	3	3	
31	ACD 537	Engineering Mechanics	3	3	
32	ACD 599	Senior ACD Project	3	3	

APPENDIX (1.3)

Diplomas in the Department of Computer Science and Engineering

1) Diploma in Computer Engineering

The student must complete the 27 credit hours of the following courses.

CSE 501- CSE 502- CSE 503- CSE 504- CSE 505- CSE 506- CSE 507- CSE 508- CSE 599

The student chooses 9 credit hours from the following courses.

CSE 509- CSE 510- CSE 511- CSE 537- CSE 538- CSE 539- CSE 540- CSE 541- CSE 542

2) Diploma in Software Engineering and Computer Applications

The student must complete the 27 credit hours of the following courses.

CSE 513- CSE 514- CSE 515- CSE 516- CSE 517- CSE 518- CSE 519- CSE 520- CSE 599

The student chooses 9 credit hours from the following courses.

CSE 521- CSE 522- CSE 523- CSE 543- CSE 544- CSE 545- CSE 546- CSE 547- CSE 548

3) Diploma in Computer Networks

The student must complete the 27 credit hours of the following courses.

CSE 525- CSE 526- CSE 527- CSE 528- CSE 529- CSE 530- CSE 531- CSE 532- CSE 599

The student chooses 9 credit hours from the following courses.

CSE 533- CSE 534- CSE 535- CSE 549- CSE 550- CSE 551- CSE 552- CSE 553- CSE 554

Courses of Postgraduate Diplomas in Computer Science and Engineering

No.	Code	Courses	Credit Hours	Exam Hours	Pre-requisite
1	CSE 501	Advanced Computer Eng.,	3	3	
2	CSE 502	Introduction to Computer Security	3	3	
3	CSE 503	Digital systems Engineering	3	3	
4	CSE 504	Data Transfer between Computers	3	3	
5	CSE 505	Image Processing	3	3	
6	CSE 506	Multimedia	3	3	
7	CSE 507	Computer Networks	3	3	
8	CSE 508	Artificial Intelligence	3	3	
9	CSE 509	Database Systems	3	3	
10	CSE 510	Parallel Processing	3	3	
11	CSE 511	Operating Systems	3	3	
12	CSE 513	Software Engineering	3	3	
13	CSE 514	Computer Architecture	3	3	
14	CSE 515	Computer Applications	3	3	
15	CSE 516	Data Structure and Algorithms	3	3	
16	CSE 517	Programming Language	3	3	
17	CSE 518	Algorithm Analysis	3	3	
18	CSE 519	Compiler Design	3	3	
19	CSE 520	Advanced Software Engineering	3	3	
20	CSE 521	Knowledge Systems	3	3	
21	CSE 522	Advanced Programming Language	3	3	
22	CSE 523	Knowledge Eng.	3	3	
23	CSE 525	Computer Network Engineering	3	3	
24	CSE 526	Network Protocols	3	3	
25	CSE 527	Computer Network Design	3	3	
26	CSE 528	Computer Network-1	3	3	
27	CSE 529	Computer Network	3	3	

No.	Code	Courses	Credit Hours	Exam Hours	Pre-requisite
		Applications			
28	CSE 530	Multimedia Networking	3	3	
29	CSE 531	Computer Network-2	3	3	
30	CSE 532	Computer Network Security	3	3	
31	CSE 533	Local Area Network	3	3	
32	CSE 534	Network Operating Systems	3	3	
33	CSE 535	Network Management	3	3	
34	CSE 537	Microprocessor Eng.	3	3	
35	CSE 538	Digital Signal Processing	3	3	
36	CSE 539	Information Systems	3	3	
37	CSE 540	Systems Analysis & Design	3	3	
38	CSE 541	Computer Graphics	3	3	
39	CSE 542	Advances in Computer Science and Engineering	3	3	
40	CSE 543	Object Oriented Programming	3	3	
41	CSE 544	Network Programming	3	3	
42	CSE 545	Natural language Processing	3	3	
43	CSE 546	Advanced Operating Systems	3	3	
44	CSE 547	Modeling & Simulation	3	3	
45	CSE 548	Advanced Software Eng.	3	3	
46	CSE 549	Network Software simulator	3	3	
47	CSE 550	Network Evaluation	3	3	
48	CSE 551	Distributed Multimedia Systems	3	3	
49	CSE 552	Communication Network	3	3	
50	CSE 553	Distributed Network and Internet Applications	3	3	
51	CSE 554	Wireless Computer Networks	3	3	
52	CSE 599	Research Project	3	Discussion	

APPENDIX (2)

COURSES OF MASTER OF SCIENCE IN ELECTRONIC ENGINEERING (LEVEL-600)

APPENDIX (2.1)

Department of Electronics and Electrical Communication Engineering

The student chooses 18 credit hours from the following courses in addition to the 18 credit hours for the EEC- 699.

No	Code	Courses	Credit Hours	Exam Hours	Pre-requisite
1	EEC 601	Image Processing	3	3	
2	EEC 602	Medical Imaging Systems	3	3	
3	EEC 603	Pattern Recognition	3	3	
4	EEC 604	Adaptive Signal Processing and Applications	3	3	
5	EEC 605	Speech Processing	3	3	
6	EEC 606	Discrete Transforms and Their Applications	3	3	
7	EEC 607	Advanced Applications of Neural Networks	3	3	
8	EEC 608	Spread Spectrum Communications	3	3	
9	EEC 609	Advanced Communication Systems	3	3	EEC 608
10	EEC 610	Modern Digital Modulation Systems	3	3	
11	EEC 611	Modern Coding and Encryption Systems	3	3	
12	EEC 612	Wireless Computer Networks	3	3	
13	EEC 613	Optical Computer Networks	3	3	
14	EEC 614	Propagation theory of Electromagnetic Waves	3	3	
15	EEC 615	Microwave Devices and Circuits	3	3	
16	EEC 616	Numerical Methods for Antennas	3	3	
17	EEC 617	Advanced Antenna Engineering	3	3	
18	EEC 618	Microwave Antennas	3	3	
19	EEC 619	Electromagnetic Scattering	3	3	
20	EEC 620	Remote Sensing	3	3	

21	EEC 621	Advanced Digital Integrated Circuits	3	3	
22	EEC 622	Analog MOS Integrated Circuits	3	3	
23	EEC 623	Computer-Aided Design of Integrated Circuits	3	3	EEC 621
24	EEC 624	Biomedical Electronics Equipments	3	3	
25	EEC 625	Advanced IC Processing and Layout	3	3	EEC 621
26	EEC 626	Superconductive Devices and Circuits	3	3	
27	EEC 627	Tele-traffic Engineering	3	3	
28	EEC 628	Advanced Optical Communications	3	3	
29	EEC 629	Advanced Communications Circuits	3	3	
30	EEC 630	Statistical Communication Systems	3	3	
31	EEC 631	Advanced Applications of Microprocessors	3	3	
32	EEC 632	Modern Radar and Sonar Systems	3	3	
33	EEC 633	Laser Systems	3	3	
34	EEC 634	Advanced Quantum Mechanics and Optical Electronics	3	3	
35	EEC 635	Optical Devices and Applications	3	3	
36	EEC 636	Advanced Applications of Acoustic Devices	3	3	
37	EEC 637	Propagation of Sound Waves Under Water	3	3	
38	EEC 638	Fabrication of Nanomatrials and nanostructures	3	3	
39	EEC 639	Nano-Optics and Applications	3	3	EEC 621
40	EEC 699	Thesis of Master of Science in Engineering	18	Discussion Oral Examination	

APPENDIX (2-2)

Department of Industrial Electronics and Control Engineering

Master of Science in Automatic Control and System, in Industrial Electronics and Measurements and mechatronics and Robotics

A. Compulsory Courses

Students must complete the following Courses:

No	Code	Courses	Credit Hours	Exam Hour	Pre-requisite
1	ACD 600	Statistical analysis	3	3	
2	ACD 601	Advanced Programming using Matlab	3	3	
3	ACD 699	Master of science thesis	18	Discussion	

B. Specialized courses

Students must complete the 18 credit from the following courses:

No.	Code	Courses	Credit Hours	Exam Hours	Pre-requisite
1	ACD 610	Linear systems	3	3	
2	ACD 611	Optimal Control Systems	3	3	
3	ACD 612	Stochastic process control	3	3	ACD 600
4	ACD 613	Flight Automatic Control	3	3	
5	ACD 614	Wavelet and control	3	3	
6	ACD 615	Neural Networks Control	3	3	
7	ACD 616	Fuzzy logic control	3	3	
8	ACD 617	Real time computer control	3	3	
9	ACD 618	Selected topic in Automatic Control	3	3	

10	ACD 620	Advanced Power electronics	3	3	
11	ACD 621	Motor Drive Control	3	3	ACD 620
12	ACD 622	Advanced programmable Logic Controllers and interfacing	3	3	
13	ACD 623	Digital Control of Electric Drive Systems	3	3	
14	ACD 624	Advanced Industrial Control	3	3	
15	ACD 625	Distributed systems and SCADA	3	3	
16	ACD 626	Selected topic in industrial control	3	3	
17	ACD 630	Advanced microcontrollers	3	3	
18	ACD 631	Mobile Robotics	3	3	
19	ACD 632	Robots applications in manufacturing systems	3	3	
20	ACD 633	Time event Systems	3	3	
21	ACD 634	Advanced mechatronics	3	3	
22	ACD 635	Integrated Manufacturing Systems	3	3	
23	ACD 636	Selected topic in mechatronics	3	3	
24	ACD 637	Selected topic in robotics	3	3	

APPENDIX (2.3)

Department of Computer Science and Engineering

The student chooses 18 credit hours from the following courses in addition to the 18 credit hours for the CSE- 699.

No.	Code	Courses	Credit Hours	Exam Hours	Pre-requisite
1	CSE 601	Numerical Analysis	3	3	
2	CSE 602	Technical Language	3	3	
3	CSE 603	Modeling & Simulation	3	3	
4	CSE 604	Expert Systems	3	3	
5	CSE 605	Neural Networks	3	3	
6	CSE 606	Multi-agent Systems	3	3	
7	CSE 607	Parallel Processing	3	3	
8	CSE 608	Database Management Systems	3	3	
9	CSE 609	Distributed Database Management Systems	3	3	EEC 608
10	CSE 610	Parallel Algorithms Design	3	3	
11	CSE 611	Mobile Communication Systems	3	3	
12	CSE 612	Computer Vision	3	3	
13	CSE 613	Multimedia Security	3	3	
14	CSE 614	Encryption Eng.	3	3	
15	CSE 615	Pattern Recognition	3	3	
16	CSE 616	Microprocessor Design	3	3	
17	CSE 617	Advanced Computer Networks	3	3	
18	CSE 618	Data Compression	3	3	
19	CSE 619	Virtual Reality	3	3	
20	CSE 620	Advances in Computer Science & Eng.	3	3	
21	CSE 621	Network Programming	3	3	
22	CSE 622	Digital Signal Processing	3	3	
23	CSE 623	Optical Computers	3	3	
24	CSE 624	Embedded Systems	3	3	
25	CSE 625	Real time system	3	3	
27	CSE 699	Master's Thesis in Science Engineering	18	Discussion	

APPENDIX (2.4)

Department of Physics and Engineering Mathematics

Qualification Courses of Master Degree in Basic Science of Engineering
The student chooses 18 credit hours from the following courses.

No	Code	Course	Credit Hours	Exam. Hours	Pre-requisite
1	PME 501	Mathematical Analysis	4	3	*
2	PME 502	Ordinary Differential Equations	4	3	*
3	PME 503	Linear Algebra	4	3	*
4	PME 504	Operations Research	4	3	*
5	PME 505	Functional Analysis	4	3	*
6	PME 506	Fluid Mechanics	4	3	*
7	PME 507	Quantum Mechanics (1)	3	3	*
8	PME 508	Equations of Mathematical Physics	3	3	*
9	PME 509	Special functions	3	3	*
10	PME 510	Applied Optical	4	3	**
11	PME 511	Quantum Mechanics (2)	4	3	**
12	PME 512	Laser and its application	4	3	**
13	PME 513	Plasma physics	4	3	**
14	PME 514	Solid State Electronics	4	3	**
15	PME 515	Energy physics	4	3	**
16	PME 516	Atomic and Nuclear physics	3	3	**
17	PME 517	Theoretical physics	3	3	**
18	PME 518	Statistical Thermo-Dynamics	4	3	**
19	PME 519	Introduction to computer	4	3	***
20	PME 520	Computer and Numerical Analysis	4	3	***
21	PME 521	Materials Science	3	3	***
22	PME 522	Engineering Statistics	3	3	***

* Math. Courses for the Qualification Year
** Physics Courses for the Qualification Year
*** Math. And Physics Courses for the Qualification Year

Courses of Master Degree in Basic Science of Engineering

The Student chooses the 18 credit hours from the following courses in addition to the 18 credit hours for the PME 699.

No	Code	Course	Credit Hours	Exam. Hours	Pre-requisite
1	PME 623	Differential equations (linear, nonlinear, partial)	4	3	PME 502 *
2	PME 624	Differential Geometry	4	3	*
3	PME 625	Numerical Analysis (1)	4	3	PME 624 *
4	PME 626	Introductory probability and Applications	4	3	*
5	PME 627	Integral equations	4	3	*
6	PME 628	Topology	3	3	*
7	PME 629	Differential equations and its application	3	3	PME 502 *
8	PME 630	Statistical physics	4	3	**
9	PME 631	Solid state physics	4	3	**
10	PME 632	General engineering chemistry	4	3	**
11	PME 633	Spectroscopy	4	3	**
12	PME 634	Electromagnetic field theory	4	3	**
13	PME 635	Superconductivity theory	4	3	**
14	PME 636	Crystallography	3	3	**
15	PME 637	Optical properties of nano crystal	3	3	**
16	PME 699	Thesis of Master of basic Science in Engineering	18	Discussion	(*,**)

* Math. Courses for the Master degree.
** Physics Courses for the Master degree.

APPENNDIX (3)

COURSES OF DOCTOR OF PHILOSOPHY IN ELECTRONIC ENGINEERING (LEVEL 700)

APPENDIX (3.1)

Department of Electronics and Electrical Communication Engineering

The student chooses 18 credit hours from the courses (EEC 701 to EEC 739) in addition to the 30 credit hours of the EEC 799.

No.	Code	Courses	Credit Hours	Exam Hours	Pre-requisite
1	EEC 701	Advanced Techniques in Image Processing	3	3	
2	EEC 702	Analysis of Medical Images	3	3	
3	EEC 703	Applications of Pattern Recognition	3	3	
4	EEC 704	Applications of Adaptive Filters	3	3	
5	EEC 705	Advanced Techniques of Speech Processing	3	3	
6	EEC 706	Discrete Mathematics and Applications	3	3	
7	EEC 707	Applications of Neural Networks in Communication Systems	3	3	
8	EEC 708	Code Design For Spread Spectrum Communications	3	3	
9	EEC 709	Performance Analysis of Advanced Communication Systems	3	3	EEC 708
10	EEC 710	Performance Analysis of Digital Modulation Systems	3	3	
11	EEC 711	Analysis and Design of Coding and Encryption Systems	3	3	
12	EEC 712	Performance Analysis of Wireless Computer Networks	3	3	

13	EEC 713	Performance Analysis of Optical Computer Networks	3	3	
14	EEC 714	Propagation of Electromagnetic Waves	3	3	
15	EEC 715	Performance Analysis of Microwave Devices and Circuits	3	3	
16	EEC 716	Advanced Numerical Methods for Antennas and microwave	3	3	
17	EEC 717	Advanced Antenna Systems	3	3	
18	EEC 718	Design of Microwave Antennas	3	3	
19	EEC 719	Theory of Electromagnetic Scattering	3	3	
20	EEC 720	Applications of Remote Sensing	3	3	
21	EEC 721	Design Methods for Digital Integrated Circuits	3	3	
22	EEC 722	Design of Analog MOS Integrated Circuits	3	3	
23	EEC 723	Advanced Techniques for Computer-Aided Design of Integrated Circuits	3	3	EEC 721
24	EEC 724	Performance Study of Biomedical Electronic Equipments	3	3	
25	EEC 725	Advanced IC Design	3	3	EEC 721
26	EEC 726	Design of Superconductive Circuits	3	3	
27	EEC 727	Capacity Analysis of Communication Systems	3	3	
28	EEC 728	Advanced Techniques in Optical Communications	3	3	
29	EEC 729	Analysis and Design of Communications Circuits	3	3	

30	EEC 730	Advanced Statistical Communication Systems	3	3	
31	EEC 731	Applications of Microprocessors in Communication Systems	3	3	
32	EEC 732	Advanced Techniques in Radar and Sonar Systems	3	3	
33	EEC 733	Design of Laser Systems	3	3	
34	EEC 734	Applications of Quantum Mechanics	3	3	
35	EEC 735	Design of Optical Devices and Components	3	3	
36	EEC 736	Design of Acoustic Devices and Components	3	3	
37	EEC 737	Propagation of Sound Waves Under Water	3	3	
38	EEC 738	Advanced Techniques for Nano material Fabrication	3	3	
39	EEC 739	Applications of Optical Properties of Nano material	3	3	EEC 738
40	EEC 799	Ph. D. Thesis	30	Discussion	

APPENDIX (3.2)

Department of Industrial Electronics and Control Engineering

The student chooses 18 credit hours from the courses (ACD 701 to ACD 739) in addition to the 30 credit hours of the ACD 799.

No.	Code	Courses	Credit Hours	Exam Hours	Pre-requisite
1	ACD 711	Large Scale and complex systems	3	3	
2	ACM 712	Fuzzy modeling	3	3	
3	ACD 713	Neuro-Fuzzy systems		3	ACM 712
4	ACD 714	Stability Theory	3	3	
5	ACD 715	Robust control	3	3	
6	ACD 719	Selected Topics in automatic control	3	3	
7	ACD 720	Advanced Microcontrollers & DSP	3	3	
8	ACD 721	Advanced Programmable Logic Controllers	3	3	
9	ACD 722	Advanced Electrical Drive machines	3	3	
10	ACD 723	Applications Of DSP in Electrical machine Control	3	3	
11	ACD 724	Fuzzy logic control in Electric drive systems	3	3	
12	ACD 725	Renewable energy	3	3	
13	ACD 726	Automatic control in automotive Systems		3	
14	ACD727	Computer Applications In Electrical Power Engineering	3	3	
15	ACD 728	Electric Drive control in automotive	3	3	
16	ACD 729	Selected Topics in Industrial Electronics Engineering	3	3	
17	ACD 730	Digital image processing	3	3	
18	ACD 731	Advanced automata systems	3	3	
19	ACD 732	Mems and Fems technology	3	3	

20	ACD 733	Expert systems in Robotics control	3	3	ACD 730
21	ACD 734	Robots cooperation	3	3	
22	ACD 735	Robot imaging	3	3	ACD 730
23	ACD 736	Flexible Manufacturing Systems	3	3	
24	ACD 737	(ACD 637) Flexible link robots	3	3	
25	ACD 738	Selected topic in mechatronics	3	3	
26	ACD 739	Selected topic in robotics	3	3	
27	ACD 799	Ph D. Thesis	30	Discussion	

APPENDIX (3.3)

Department of Computer Science and Engineering

The student chooses 18 credit hours from the courses (EEC 700 to EEC 717) in addition to the 30 credit hours of the EEC 799.

No.	Code	Courses	Credit Hours	Exam Hours	Pre-requisite
1	CSE 700	Technical Language	3	3	
2	CSE 701	Advanced Digital Eng. Systems	3	3	
3	CSE 702	Advanced Database Systems	3	3	
4	CSE 703	Data Warehouse	3	3	
5	CSE 704	Advanced Data Structure &Algorithms	3	3	
6	CSE 705	Computer Game Programming	3	3	
7	CSE 706	Network Security	3	3	
8	CSE 707	Watermarking and Data Hiding	3	3	
9	CSE 708	Cryptography and Encryption Algorithms	3	3	
10	CSE 709	Digital Signatures	3	3	
11	CSE 710	Advanced Computer Architecture	3	3	
12	CSE 711	Data Compression	3	3	
13	CSE 712	Distributed Systems	3	3	
14	CSE 713	ISDN	3	3	
15	CSE 714	Operation Research	3	3	
16	CSE 715	Data Mining	3	3	
17	CSE 716	Advances in Computer Science & Eng.	3	3	
18	CSE 717	Multimedia Compression	3	3	
19	CSE 799	Ph.D. Thesis	30	Discussion	

Appendix (3-4)

Department of Physics and Engineering Mathematics

Courses for Doctor of Philosophy in Basic Sciences of Engineering

The student chooses 18 credit hours from the courses (PME 701 to PME 709) in addition to the 30 credit hours of the EEC 799.

No	Code	Course	Credit Hours	Exam. Hours	Pre-requisite
1	PME 701	Probability and statistics	4	3	PME 504 *
2	PME 702	Operations Research (2)	4	3	PME 504 *
3	PME 703	Nonlinear differential equations	4	3	PME 501 *
4	PME 704	Numerical analysis (2)	3	3	PME 626 *
5	PME 705	Function Analysis (2)	3	3	PME 506 *
6	PME 706	Solid state electronics	4	3	**
7	PME 707	Optoelectronic semiconductors	4	3	**
8	PME 708	Solar cells	4	3	**
9	PME 709	Nano technology	3	3	**
10	PME 799	Ph. D. Thesis in Engineering	30	Discussion	(*,**)

* Math. Courses for the Ph.D degree in Math. Engineering.
** Physics Courses for the Ph.D degree in Physics Eng.

Appendix (4)

Course Descriptions of Postgraduate Diplomas in Electronic Engineering (Level 500)

APPENDIX(4-1)

Department of Electronics and Electrical Communications Engineering

EEC 501 Advanced Engineering Mathematics

Algorithms for the Solution of: linear simultaneous equations- simultaneous linear and non linear differential equations- iteration techniques- optimization techniques- discrete and continuous transforms- queuing theory- game theory- signal interpolation- probability distributions- numerical analysis- advanced applications .

EEC 502 Mobile Communications

Introduction to cellular mobile systems- frequency reuse- mobile radio environment - Signal propagation in urban and suburban environment -models for path loss - Rayleigh fading and lognormal ' shadowing - Co-channel interference reduction -Mobile communication protocols - Messaging and capacity -Spread-spectrum and CDMA - Paging.

EEC 503 Communications Circuits

General electronic circuitry used in communication systems- mixers- up & down converters- PLL- filter design- attenuators- phase shifters- Hilbert transformers- hybrids - Carrier and clock recovery circuits - Pulse and timing circuits - Signal processing circuits-Switched capacitor circuits.

EEC 504 Digital Communication Systems

Digital carrier modulation - M-ary signaling. Multiple-access techniques- FDMA- TDMA- CDMA. Detection of digital signals- optimum receivers. Orthogonal frequency division multiplexing. Error control coding. Applications to digital communication systems such as satellite- microwave links- radar and mobile systems.

EEC 505 Statistical Communications and Information Theory

Random processes and spectral densities- random signals through linear and nonlinear systems - Wide-sense stationary process and filtering- white noise- non-Gaussian distributions -The concepts of source- channel- and rate of transmission of information. Entropy- mutual information- and channel capacity- Source coding - Rate distortion theory - Noisy channels- the coding theorem for finite state memoryless channels - Markov chains. Applications.

EEC 506 Computer Networks

Architectures and protocols - Objective of computer networks- computer structure and components- switching techniques- network functions- layered network architectures- data link protocols- network control- transport and session protocols- presentation layer protocols - Specific examples and standard protocols are cited for point-to-point- satellite- packet radio- and local area networks. Examples of modern computer networks- local network architecture – local network protocols-optical networks.

EEC 507 Optical Communication Systems

Optical versus radio frequency communications - Optical fibers - Ray representation in optical fibers - Modal analysis in step and graded index optical fibers - Signal degradation - Optical receivers - Optical properties of III -V semiconductors - Emitters: SC laser diodes- light emitting diodes - Photo detectors PIN and avalanche photo diode (APD)- Optical amplifiers- Optical filters. Examples of modern optical communication systems.

EEC 508 Satellite Communication Systems

Satellite orbits. Frequency allocations. Satellite antennas. Propagation effects - Power budget and noise - Modulation techniques - Digital modulation and coding - Multiplexing and multiple access techniques - Transmitter and receiver design –Analysis of satellite channel- Applications.

EEC 509 Network Planning

Stages in Planning- Present Network Knowledge- Traffic Forecasts- Plant Details- Network Standards- Numbering Plan- Charging Plan- Routing Plan- Signaling Standards- Grade of Service- Local Network Planning- Growth Planning .

EEC 510 Antennas and Wave Propagation

Communication With Radio Wave- Fundamentals of Electromagnetic Radiating Antenna and Antenna Impedance: Some Basic Antenna Parameters- Dipoles- Arrays and Long Wire Antenna- Biconical Antennas- Folded Dipole Antenna- Baluns- Array Pattern Synthesis: Feed Network for Array- Phased Arrays- Aperture Type Antenna- crossed field antennas- Application of Field Equivalence Principles to Aperture Radiation- Open Wave-Guides and Horn Antennas- Receiving Antennas: Reciprocity Theorem and Effective Area for Antennas- Receiving Antennas: Reciprocity Theorem and Effective Area for Antennas- Antenna Noise Temperature- Propagation: Surface Wave

Propagation- Ionospheric Propagation- Microwave and Millimeter Wave Propagation- Microstrip Antenna .

EEC 511 Signal Processing and Applications

Discrete Fourier Transform- FFT Z Transform- Digital Filter- Adaptive Filters- Application of Adaptive Filter- Echo Cancellers and Suppressors- Digital Signal Processing of Speech- Digital Image Processing- Applications of Digital Signal Processing to Radar Sonar Signal Processing- Digital Signal Processing in Geophysics- Advanced applications of signal processing .

EEC 512 Neural Networks and Applications

Anatomical -and physiological properties of neural networks -Mathematical modeling - information capacity - Network adaptation- learning- and self-organization - Applications to pattern recognition- associative memory- and classes of optimization problems - Algorithmic approaches- single and multi-layered- deterministic and stochastic - The problem of connectivity and implementation approaches-Applications.

EEC 513 Microprocessor and Applications

Microprocessors fundamentals - microprocessor architecture - Commands and programming - Assembly language - Types of interrupt signals - Interfacing micro processors with I/O units and circuits - Applications. Microprocessors applications in communications- Methodologies- tools- and practical experience in the design and implementation of digital systems using microprocessors- memories- and peripheral devices - Proposal- design- implementation- and evaluation of individual projects - Use of logic state analysis and microprocessor development stations.

EEC 514 Radar and Sonar Systems

Radar fundamentals- physics and overview of electromagnetic scattering- exact prediction techniques- high frequency RCS prediction techniques- phenomenological examples of radar cross section- radar cross section reduction- radar absorbing materials- radar absorber measurement techniques- antenna RCS and RCSR –RCS measurement requirements- outdoor RCS test ranges- indoor RCS test ranges- high pocket RCS estimation- data presentation and reduction- Laser radar- ultrasonic radar- Sonar Systems.

EEC 515 Advanced Electromagnetic Field Theory

Guided waves- plane- cylindrical- spherical - Radiation- scattering and identification as boundary value problems -Introduction to tensor analysis -

Propagation in multi-stream ionized anisotropic media. Propagation in moving media. Relativistic effects - Propagation in inhomogeneous and random media.

EEC 516 Design of Microwave Circuits

Surface guiding and dielectric optical waveguides - Microstrip lines and resonators - Wave propagation in ferrites. Scattering matrix - Microwave passive devices –Microwave filters-Microwave couplers-Microwave components- Radiation from wire antennas - Pattern - Impedance and gain. Antenna arrays - Polynomial Array theory. Phased arrays and null-steering.

EEC 517 Microwave Electronics

Microwave Semiconductor Devices- Two Terminal Microwave Devices and Their Use in Detection- Mixing Change of Phase and Displacement- Negative Resistance Microwave Devices and Their Use in Amplifiers- (FET) Transistor FET in Microwave Amplifiers .

EEC 518 Microwave Measurements

Manual and automatic microwave network analyzer measurements -Power- Power spectrum- and noise measurements Characterization of devices and systems - Special topics will include design and construction of microwave devices- RCS and antenna measurements- microstrip measurements- and microwave circuit measurements -Laboratory experiments dealing with the above topics.

EEC 519 Antenna Arrays Theory

Linear and planar uniform arrays - Circular and elliptical arrays - Nonuniformly fed arrays - Array synthesis techniques - Phased arrays Omnidirectional arrays - Adaptive arrays and beam forming - Random arrays and aperture thinning - Signal processing arrays.

EEC 520 Numerical Methods for Electromagnetic Fields

Mathematical methods in electrostatics and magnetostatics-The canonical forms of partial differential equations-Finite difference approximations. Boundary and initial value problems-Interpolation and approximation. Finite element methods-Method of moments and applications-Computer implementations of some of the considered numerical methods.

EEC 521 Electro-Optics and Lasers

Propagation of laser beams: Gaussian wave optics and the ABCD law - Crystal properties and the dielectric tensor- Electro-optic effects and devices- Acousto-

optic diffraction and devices - Introduction to nonlinear optics: coupled mode theory : and second harmonic generation- phase matching - Laser resonators- eigenmodes- and stability analysis- Rate equation analysis- Homogeneous and inhomogeneous broadening mechanisms- Laser gain and gain saturation- Q-switching and mode locking -Special topics: laser pulse compression- Raman and Brillouin scattering- phase conjugation.

EEC 522 Wave Propagation in Biological Media

Medical terminology-dielectric behavior of biological molecules- measurement of the electrical constants of the human body - Radiative signals in human body - Microwave components used for human body- Magnetic resonance imaging- X-ray imaging- CT imaging- Gamma ray imaging.

EEC 523 Solid State Electronics

Crystals structure and symmetries - Energy-band theory Cyclotron resonance - Tensor effective mass - Statistics of electronics state population - Recombination theory – Carrier transport theory. Interface properties - Optical processes and properties.

EEC 524 Quantum Mechanics and Optical Electronics

The wave equation- Schrödinger equation: Steady state form-Particle in a box-Finite potential well-Tunnel effect- Harmonic Oscillator . The laser principles-analysis of specific laser systems such as gas lasers- semiconductor lasers- and other solid-state lasers- laser dynamics- noise phenomena- nonlinear optics-guided wave optics- selected applications of coherent optics.

EEC 525 Integrated Circuits and Applications

The IC Processes- The NMOS- The CMOS and The Bipolar Process- Active Elements- Passive Elements- Layout of IC's- Building Blocks of Analog IC's-Building Blocks of Digital IC's- Analog Circuits- Digital Circuits and Systems.- Integrated circuits implementation- vertical implementation- design rules-design of IC bulk- opposite metal oxide negative semiconductor as a base unit for digital circuits- noise: propagation delay time of power lost- metal gates circuits- negative semiconductor and metal- oxide synchronous semiconductor-gallium circuits- digital arsenide- complete injection gates- transistor gates-semiconductor design of memory circuits- read only memory- storage memory-building of programmable sets.

EEC 526 VLSI and Applications

General introduction- using SIPES in MOS transistor modeling – semiconductor- fabrication technology- dynamic and static properties of inverters- execution process- logic and sequential circuits- MOS circuits. Analysis of switching- timing- wave shaping- and logic circuits using computers. Circuit models for solid state devices and IC's in highly nonlinear circuits using computers.

EEC 527 Optical and Optoelectronic Devices

Visible and infrared photodetectors- including PIN and avalanche photodiodes- photon counting devices and image intensifiers -imaging detectors- including vidicons and charge tupled Devices - display devices semiconductor lasers- tusto-optic- electro-optic- and waveguide modulators- flinonlinear optics- including second harmonic generation and p 'optical bistability- Integrated optics..

EEC 528 Super-Conductor Components and Applications

Super conductor materials- Theory of operation- models of superconductors- Super conductor components- Applications.

EEC 529 Introduction to Biomedical Electronics

Medical instrument- vital transmission principles- vital transmission of electrical potential application- principles of design and application of filters- measurements of blood pressure- lab.-analysis instruments- medical computer systems-principle of design and amplification- X ray- XT ray – magnetic principles of electrical safety in medical instruments.

EEC 530 Acoustic Devices and Applications

Basic principles- waves- propagation- impedance- reflection- trans- mission- attenuation- scattering- power levels -Generation of ultrasonic waves- transducers- focusing -Fraunhofer and. Fresnel zones - Instrumentation- display methods- Doppler techniques- signal processing. Industrial and medical applications will be emphasized.

EEC 531 Acoustics and Ultrasonics

Plane and spherical waves - Simple and compound sound sources - Dynamically analogous mechanical and acoustical circuits - Acoustic transducers - Loudspeakers- types and systems - Microphone- types and systems - Measurements of sound - Acoustics and Hearing - Acoustic environment outdoors - Acoustic environment indoors - Ultrasonic applications.

EEC 532 Television Engineering

Transmission Requirements- Color Mixing and Color Signals- Transmission Systems- Effect of Transmission Errors- Chrominance Signals- Coding and Decoding of Color Information Color Receivers- Special Circuits for Color TV . Comb Filters- Separation of Chrominance and Luminance- Transcoders- Techniques for Bit Rate Reduction- Digital Coding- Digital TV Techniques .

EEC 533 Room Acoustics

Sound isolating materials and their characteristics- Sound propagation in buildings- sound propagation in closed rooms- Sound equalization- Analysis of sound signals.

EEC 534 Speech Recognition

Characteristics of speech signals- Feature extraction methods- feature matching methods- Speech recognition criteria- Speech codes.

EEC 535 Under Water Acoustics

Media characteristics for acoustic waves- Acoustic wave propagation underwater-Effects of media on acoustic waves- underwater imaging using acoustic waves- Applications.

EEC 536 Nanomatrial and nanostructure fabrication

Synthesis of Nanostructure:Principles of preparation-Nanomechanical structure generation- Nanolithography- Nanofabrication by scanning probe technique-Nanotechnical structure: Inorganic solids- Organic solids and layer structure-Molecular monolayer and architectures- Architectures with single molecules-Combination of molecular architectures and nanoparticle with planar technical structure.

EEC 537 Optical properties of Nanocrystal

Electron states in an ideal nanocrystal- General properties of spectrally inhomogenous media- Absorption and emission of light by semiconductor nanocrystals- Resonant optical nonlinearities- Interface effects.

EEC 538 Luminescent nanomaterials

Excitons in semiconductor nanocrystal- The III-V quantum dot systems-Quantum dots as artifical atoms or molecules and clusters- II-VI quantum dots systems- QD- conjugated polymer composites.

EEC 539 Devices based on nanostructures
Nanotransducers- Nanoelectronic devices- Nanodiodes- Nanooptical devices- Magentic transducers.

EEC 540 Theoretical models for nanocrystals
Effective mass aproxmation- Pesudopotential method- Tight binding calculation - Effective bond order model.

EEC 541 Modern Spectroscopy
Electromagnetic radiation and its interaction with atoms and molecules- General features of experimental metods- Rotational spectroscopy- Vibrational spectroscopy- Electronic spectroscopy- Lasers and Laser spectroscopy.

EEC 599 Research Project
Independent individual study or investigation of problems in a field related to the Diploma- under the supervisions of a faculty member.

APPENDIX (4.2)

Department of Industrial Electronics and Control Engineering

(ACD 500) Engineering Mathematics

Correlation functions- calculation of eigen-values and vectors- finding the roots of power series- z-transform- difference equations- Fourier transformation- fast Fourier transforms – inverse Fourier transforms- Case study.

(ACD 501) Advanced Programming and Algorithms

Introduction- types of languages- representation of principle functions- Efficient design of algorithms. Data building and control by means of the language- Engineering applications.

(ACD 502) Digital Signal Processing and systems

Signal fundamentals (types-properties-representation) –Linear filters-least squares-least mean squares- prediction- adaptive filters. method of signal analysis and processing. Adaptive filters and its applications - spectrum signal analysis – Applications.

(ACD 510) Control system analysis

Root locus analysis and design. Frequency response (Nyquist criteria- Pode diagram)- stability based on frequency domain- frequency domain compensation. Phase and gain margins- design methods- Applications on MATLAB- Case study.

(ACD 511) System identification

Introduction- Physical description- autocorrelation- cross-correlation- off line least squares – on-line least squares-classification methods- advanced identification methods -applications - Case study. .(Prerequisite ACD 502)

(ACD 512) System Modeling and Simulation

Introduction- Physical description- mathematical description – system identifications- methods of simulation- verification of simulation- continuous systems- discrete systems- computer languages- advanced simulation techniques -applications - Case study.

(ACD 513) Digital Control Systems
Signal analysis and signal transformation- sampling theorem- discrete transfer function-block diagrams- stability- frequency response- root locus- Nyquist diagrams- digital controllers (P-PI-PID) - Case study.(Prerequisite ACD 502)

(ACD 514) Process Control
Modeling of temperature- pressure- flow rate and level systems- classical controllers-sensors-actuators- digital controllers- adaptive controllers- Case study.

(ACD 515) Control System Troubleshooting
Trouble shooting of sensors and transmitters - trouble shooting of actuators-trouble shooting of the controllers-trouble shooting of the software. Trouble shooting backages.

(ACD 516) Modern control systems
Introduction to automatic control systems representation - State space

(ACD 522) Quality Control
representation- and solution of state equations. Controllability- observability - state feedback design- pole assignments- Introduction to optimal control.

(ACD 517) Adaptive Control Systems
Direct and indirect adaptive control - signal adaptive control - parameter adaptive control - error analysis- self-tuning control-model reference adaptive control-case study. (prerequisite ACD 511)

(ACD 518) Nonlinear systems
Describing function- stability using phase plane- Liaponov stability methods for linear and nonlinear systems- introduction to hyper stability method.

(ACD 519) Selected topic in Automatic Control
This course should include the modern and the new scientific materials These topics are : Embedded Control system, Discrete Event based control system, Supervisory control system.

(ACD 520) Industrial Measurement
Process measurements: temperature- pressure- flow rate and level sensors-transmitters- data acquisition- data loggers - Case study.

(ACD 521) Artificial Intelligence and Expert Systems

Overview – Knowledge – programming languages – formalized symbolic logics – probability reasoning –search and control strategies – matching – Knowledge organization and managements – natural language – learning – applications.

History - Craft and tradespersons - Wartime production - Postwar - Quality assurance - Failure testing - Statistical control - Company quality - Total quality control – case study.

(ACD 523) Logic controllers and PLC

Introduction- advantages of the utilization of PLC- PLC architecture- logic and sequential control circuits- PLC programming (Ladder diagram-instruction list-function diagrams) –flip flops- counters and timers- applications.

(ACD 524) Power Electronics

Power transistors- DC choppers – Inverters (single phase- double phase- phase reduction) – chuc inverter- converter classifications- inverse converters from AC to DC(half bridge- full ACD

(ACD) 525 Industrial Electronics Applications

Introduction – solid state devices- Welding – voltage stabilizers- static protection- heating – induction heating – related applications.

(ACD 526) Classical controllers

Classical compensation- PID classical controllers- controller tuning - m-circles- Ziegler Nichols-robust controllers- Industrial controllers - case study.

(ACD 527) Motor Control Troubleshooting

Introduction – maintenance scheduling – motor trouble shooting – sensor troubleshooting – actuator troubleshooting – computer troubleshooting. Case study.

(ACD 528) Selected topic in Industrial electronics

This course should include the modern and the new scientific materials concerning the course- which is needed for students- Case study.

(ACD 529) Microcontrollers
Introduction- Microcontrollers architecture and basic functions- memory map- interfacing circuits- extension of input and output- A/d and D/A –Programming - Applications- Case study.

(ACD 530) Advanced Interfacing & networking
Types of interfacing cards- types of interfacing- parallel interfacing- - interfacing of timers and counters- interfacing through interrupts- Computer Networking based Control Systems Computer networks topology- layers- protocols- LAN- Data transfer- programming methods- Large systems- Industrial applications.

(ACD 531) Data communications
Types of interfacing cards - serial interfacing - modem interface- random processing based on communications- Data transmission- Transmission media- Long distance communication. Data coding and encoding and modulating- response of digital communication systems in noisy media- protocols- Case study.

(ACD 533) Robotics
Introduction to robotics- geometry- Actuators- sensors and vision- kinematics and inverse kinematics- task planning - Equations of motion- robot position and trajectory design- robot programming- applications-

(ACD 533) Mechatronics
Design methods. Engineering material selection- Mechatronics components design (efficiency-durability- strength) – Design of power transmission including gears and clutches and brakes -Static and dynamic loading - design of moving part including bearing- machinery design- Factor of safety. Design of basic mechanical elements. CAD applications- Case study.

(ACD 534) Selected topic in mechatronics
This course should include the modern and the new scientific materials concerning the course- which is needed for students- Case study.

(ACD 535) Selected topic in robotics
This course should include the modern and the new scientific materials concerning the course- which is needed for students- Case study.

(ACD 536) Fluid Mechanics

Elements of fluids mechanics – Forces on surfaces — Pressure- Ideal flow- Thermal conduction in fluids – Diffusion – Surface phenomena – Flow in pipe- Fluid dynamics – Simulation of fluid systems

(ACD 537) Engineering Mechanics

Kinematics of a particle. Kinetics of a particle. Force and acceleration. Work and energy. Impulse and momentum. Planar Kinematics and kinetics of rigid bodies.

(ACD 599) Senior ACD Project

The student can chose one of the presented projects after complete of 9 credits. The project presentation is performed after completion of 27 credits.

APPENDIX (4.3)

Department of Computer Science and Engineering

CSE 501 Advanced Computer Engineering
Fundamentals of computer design: cost models- performance models- evaluation methodologies- implementation techniques and tools. Topics include instruction set architectures- pipeline design- memory system design- and basic concepts in storage systems. Understanding the rules of parallelism and power in current and possible future computer designs is a growing component.

CSE 502 Introduction to Computer Security
Different levels of data security inception algorithms and cryptographic techniques including block and system ciphers- key management- and digital signature. Access control mechanism. Information flow control mechanism inference controls. Operating system security aspects. Network and Internetwork- security including electronic mail and network management security.

CSE 503 Digital Systems Engineering
The basic aspects of digital systems, advanced logic design, Programmable Logic Arrays (PLAs), Field Programmable Gate Arrays (FPGA) Hardware Description Language (HDl), smart devices.

CSE 504 Data Transfer Between Computers
The course covers OSI model- line topologies- LAN- MAN- WAN- introduction to circuit switching- packet switching- ATM- x.25 etc- signals (analog and digital)- Fourier series and transform- Fourier transform properties- modulation and encoding techniques- multiplexing techniques- error correction & detection techniques.

CSE 505 Image Processing
An introduction to basic techniques of analysis and manipulation of pictorial data by computer. Image input/output devices- image processing software- enhancement- segmentation- property measurement- Fourier analysis. Computer encoding- processing and analysis of curves.

CSE 506 Multimedia
Multimedia basics and technology. Steps to producing a multimedia application. Staffing and skills for multimedia production. Multimedia hardware. Designing the application: graphic design- capturing still images- producing full-motion videos- creating soundtracks- and then bringing all together with programming or authoring. Object oriented multimedia programming.

CSE 507 Computer Networks
Computer network environment network hardware and software standard models network examples and service network architecture layers- protocols- services network applications-high-speed network.

CSE 508 Artificial Intelligence
AI definitions- AI applications- knowledge importance- knowledge based system- knowledge representation- search problems- blind search- informed search- structured knowledge- associative network- object oriented representation- rule based systems architectures- knowledge acquisition. General learning model learning by induction.

CSE 509 Database Systems
An overview of database system- database management system architecture- database administration- data communication manager. Distributed processing. Relational data structure: relational data structure- repeating groups- relation integrity rules. Relational calculus: a syntax for the relational algebra- SQL language. Database design. Concurrency- security. Object oriented systems.

CSE 510 Parallel Processing
Introduction to parallel processing: parallelism in Uni-processor systems- parallel computer structures- architecture classification schemes- parallel processing application- principles of pipe-lining processors- vector processors- multiprocessors. Architecture. Data flow computers. VLSI computation. Analysis of memory organizations. The economics of a processor project. Programs behavior. Performance analysis. Multiprocessors shared memory. I/o system support for multiprocessor. Processor studies. Co-design embedded systems. Case studies. New trends in computer architecture.

CSE 511 Operating Systems
Basic introduction to operating systems regarding their relevant design techniques and structuring methods. Basic concepts processes- process

scheduling- memory management- file systems- input/output- and deadlocks. Prelude to distributed operating systems in general- and modern systems in particular such as object-oriented systems and real-time systems.

CSE 512 Selected Topics in Computer Science and Engineering

Selected topics on recent developments in computer engineering will be presented in this course. Course material will reflect the needs of the graduate students and their research activities.

CSE 513 Software Engineering

Introduction: well engineered software- the software process- management process models. Human factors in software engineering- knowledge processing- group working- software specification: software requirements definition- system modeling- requirements specification- software prototyping- formal specification- algebraic specification- model-based specification. Software design: the design process- design strategies- design quality. Object oriented design: function oriented design case tools. User interface. Validation and verification.

CSE 514 Computer Architecture

Definition and terms of computer architectures- instruction sets- basic data types- addressing modes- memory organization: virtual memory and virtual top real mapping memory hierarchy and cache memory- massive storage's- Interfacing. Conventional architecture- pipelined processors- parallel array processors- re-configurable parallel array processors- associative processors- massively parallel processors. I/O systems organization- I/O processors- I/O channels- I/O support for multiprocessors- multiple servers- single-server- disk modeling- inverted servers- disk cache buffers- concurrent disk- clusters of independent disks- disk arrays- redundancy in disk array.

CSE 515 Computer Applications

Computer control principles- digital proportional- derivative- integral control- pole-placement digital control- independent regulation and tracking pole-placement control. Minimum variance controller- generalized minimum variance control. Computer process identification using least squares method. Practical tips of industrial process identification-using Matlab for control algorithms simulation.

CSE 516 Data Structure and Algorithm
Programming principles such as structuring- looping- and data structures. Complexity measures. Program performance. Arrays- queues- stacks- lists trees. Searching- hashing- sorting- traversal of trees and graphs. Emphasis on typical exercises and examples.

CSE 517 Programming Language
Main characteristics of computer languages. Languages are classified into imperial languages such as Pascal or c. Artificial intelligence languages such as prolog- object oriented programming languages and parallel architecture languages. A stress on the compiler design issues for these languages is also presented in this course.

CSE 518 Algorithm Analysis
A systematic study of the complexity of some elementary algorithms related to sorting- graphs and trees- and combinations.

CSE 519 Compiler Design
Functions of a compilers its phases and design issues. Lexical analysis- passing- code optimization and code generation. Each compilation phase is to be studied with depth and stress on the theories- algorithms and design examples. Programming exercises are needed to get the in hand experience required for the students of such course.

CSE 520 Advanced Software Engineering
This course presents some advanced topics of software engineering using group projects as the basic vehicle. Topics covered include systems planning- managing complexity- requirements specification- architectural and detailed design- design for reusability- reliability and testability. The tools and environments.

CSE 521 Knowledge Systems
Origins- importance- applications- limitations. Structure- development. Forward and backward chaining architectures. Rule systems- production systems. Tools- expert system shells. The clips production system language. Knowledge acquisition techniques. Uncertainty (bayesian methods- mycin certainty factors- fuzzy logic). Case studies (mycin- prospector- teiresias). Applications: diagnosis- configuration- decision support systems. Reasoning (case based- model based- qualitative). Classification- knowledge discovery in data bases.

CSE 522 Advanced Programming Languages

The course is designed to make the student fluent in several radically different classes of programming languages such as: imperative programming language (p.l.) - declarative p.l.- functional p.l. And object oriented p.l.- stress on the semantics of the studied programming languages is also presented in this course. Representative languages of each class will be considered such as: c- prolog- c++- small talk.

CSE 523 Knowledge Engineering

Knowledge representation using the following techniques: formal logic including first order predicate logic- rule-based approaches- semantic nets- frames- conceptual dependency- and scripts. Representation of knowledge uncertainty using probabilistic and fuzzy based approach- knowledge acquisition techniques. Knowledge processing and language support. Methodologies for knowledge information.

CSE 525 Computer Network Engineering

Network architecture: protocols and services. High-speed networks: ATM networks. Traffic characteristics and models. Congestion and flow control mechanisms. New trends in network applications and their impacts on the network architecture: multimedia-video conferencing-video-on-demand and real-time applications. Network management functions and standards: ISO and internet models. Network security problems and schemes

CSE 526 Network Protocols

The course contains install network monitor- identify the components and security restrictions of network monitor- design ip filters- troubleshoot network monitor related problems- identify the need- functions- and benefits of ipsec- activate- add- edit- and manage ipsec policies- assign an ipsec policy to a group policy- add ipsec rules to secure communications- identify the connection types affected by adding ipsec rules- identify the authentication methods defined by ipsec rules- configure ipsec for the tunnel and transport mode- add and edit filters and filter actions- add and configure ipsec security methods- and troubleshoot problems encountered while working with ipsec

CSE 527 Computer Network Design

This course covers topics on advanced ip addressing- routing principles- configuring the eigrp- configuring the open shortest path first protocol- configuring is-is- manipulating routing updates- and configuring basic bgp. The

course teaches the student how to design- configure- maintain- and scale a routed network. It focuses on using routers connected in lans and wans typically found at medium-to-large network sites.

CSE 528 Computer Network-1

Architecture of high speed network protocols. Physical layer concepts and network access methods with emphasis on optical-based techniques. Data link layer concepts using asynchronous transfer mode and fast switched local network techniques. Inter-networking protocols with emphasis on new generation internet. Transport layer protocols with emphasis on performance issues. Application layer issues with emphasis on quality of service for multimedia applications.

CSE 529 Computer Network Applications

Multimedia network application environment including e-mail- ftp- and telnet. Searching techniques including intelligent agents. Hypertext and hypermedia transfer protocol. Different hypertext makeup languages including virtual reality makeup language. Programming languages for networked application.

CSE 530 Multimedia Networking

Distributed multimedia application including distance learning and video conferencing. Networking requirements for multimedia traffic. Architectures and algorithms for controlled quality of service. Operating system support for distributed multimedia. Multimedia protocol architectures. Synchronization representation and traffic service modeling. Mechanisms for achieving synchronization.

CSE 531 Computer Network-2

Traffic characterization of broadband services. Packet voice modeling. Video traffic characterization. Multiplexing for voice and video. Bursty traffic models. Admission control in broad band network. ATM switches (output and input queuing- multistage switch characteristics performance analysis). Congestion control mechanisms. Closed loop and rate-based traffic control.

CSE 532 Computer Network Security

Presentation of security problems- firewalls- traditional cryptography- algorithms of secret keys. Public key cryptography. Authentication protocols and digital signatures. Key production for management network applications- security of electronic mail- security of ATM networks.

CSE 533 Local Area Network

General architecture of local area network. Modeling and performance evaluation of local access protocols. Ring network models with delay and throughout analysis. Random access and bus networks. High speed lans and mans including: fast ethernet- fddi and ATM. Local area network for multimedia traffic.

CSE 534 Network Operating Systems

This course is an intensive introduction to multi-user- multi-tasking network operating systems. Characteristics of the linux- windows 2000 - NT- and XP network operating systems will be discussed . Students will explore a variety of topics including installation procedures- security issues- back up procedures and remote access.

CSE 535 Network Management

Network management requirements and systems. Network monitoring architecture. Performance- fault- and accounting monitoring. Configuration and security control. Network management for tcp/ip protocol- the simple network management protocol (snmp). Snmp basic concepts and transport-level support. Remote network monitoring. Security issues. Extensions of the protocol. Osi system-management concepts including framework and functional areas. System management functions including object- state- and relationship. Alarm and even reporting. Access control- workload and test monitoring functions.

CSE 537 Microprocessor Engineering

Evolution of most common microprocessors (Intel series- Motorola series). Architecture of 8-bit processors. Architecture of advanced processor. Microprocessor busses (data bus- address bus- control and status bus- bus multiplexing- buffering). Microprocessor machine cycle and timing. Microprocessor interfacing. Memory interfacing peripherals interfacing. I/o organization. Interrupt handling. Interfacing. Basic instruction set of a microprocessor. Applications in industry embedded systems.

CSE Digital Signal Processing

Sampling as a modulation process- aliasing- the sampling theorem- the z-transform and discrete-time system analysis- direct and computer-aided design of recursive and nonrecursive digital filters- the discrete Fourier transform (DFT) and fast Fourier transform (FFT)- digital filtering using the FFT- analog-to-digital and digital-to-analog conversion- effects of quantization and finite-word-length arithmetic.

CSE 539 Information Systems
Systems and organization. Information- decision-making and models. Types of information systems. Networked information systems. Databases and database management systems multimedia and imaging database. Applications of information systems to improve- communication- decision making- the use of knowledge- execution- and products. Information system planning. The system life cycle. System development approaches. Implementation for effectiveness and efficiency. Protecting information resources.

CSE 540 Systems Analysis and Design
The system process and its elements. The system design tools are also presented with emphasis on typical design examples. Modeling of systems is also tackled with stress on its tools and scope. An overview of database- as an element of system analysis. Typical complete design examples are to be presented in this course.

CSE 541 Computer Graphics
An introduction to the principles of computer graphics. This includes an introduction to graphics displays and systems- introduction to the mathematics of affine and projective transformations- perspective- curve and surface modeling- algorithms for hidden-surface removal- color models- methods for modeling illumination- shading- and reflection.

CSE 542 Advances in Computer Science and Engineering
Recent developments in computer science and engineering will be presented in this course. Course material will reflect the needs of the graduate students and their research activities. The main topics will include: Bio-informatics, Applications in AI, Grid computing, distributed computing.

CSE 543 Object Oriented Programming
The object-oriented programming paradigm- classes- objects- inheritance- overloading- overriding- messages- abstract data types- coad & yourdon object-oriented analysis (subjects- classes-&-objects- structures- methods- attributes)- object-oriented languages- the c++ language- exercises with win a&d.

CSE 544 Network Programming
The course discusses a number of programming facilities for the development of network applications. Attention is paid to designing and implementing applications with threads- sockets- rmi/rpc- cgi/bin- servlets- php. In addition-

attention is paid to security and modern enabling technologies like peer-to-peer systems.

CSE 545 Natural language Processing
Syntactic processing (parsing techniques- grammars for natural languages). Semantic interpretation strategies. Context and world knowledge (knowledge representation- discourse structures- belief models and speech acts). Response generation (question-answering systems- natural language generation). Introduction to machine translation (knowledge-based and statistical approaches). Speech understanding systems.

CSE 546 Advanced Operating Systems
Modern operating systems which are mostly object-oriented and-or real-time systems. Foundation for studying modern distributed operating systems. Object-oriented system design issues are surveyed such as objects- object architecture- accessing objects- relations and operations- fault tolerance- and exception handling. Real-time related topics such as adding time to objects- calendars- time projection- scheduling and verification of schedulability. The above issues are handled in a comparative way w.r.t. Classic process oriented design approaches.

CSE 547 Modeling and Simulation
Discrete event simulation- process scheduling approach- event scheduling approach- queuing theory- test signals- random number generators- model validation and verification- exposition to simulation packages.

CSE 548 Advanced Software Engineering
Recent developments in software engineering will be presented in this course. Course material will reflect the needs of the graduate students and their research activities in the field of SW engineering.

CSE 549 Network Software Simulators
Basic concepts of network simulation, network elements and components – different software packages of simulation: NS-n,….,etc. Evaluation of different networks by using different simulators.

CSE 550 Network Evaluations
This course will provide the theoretical foundation for computer network systems analysis and evaluation. With such foundation- students will learn how to model and evaluate memory systems- CPU- network systems- switches-

routers- etc. The underlying principles of computer systems analysis (which are based on stochastic theory- statistics- and queuing theory) will be studied. Several operational laws that are used in analyzing large computer systems will also be discussed.

CSE 551 Distributed Multimedia Systems

Basic elements of multimedia information systems. Multimedia spatial and temporal models. Traffic characterization and effect of the different compression techniques. Multimedia networking and quality-of-service requirements. High speed networks satisfying multimedia requirements. Distributed multimedia database systems. Operating system support for multimedia applications. Synchronization issues in multimedia communications including: reference models and their specifications. Synchronization representation and traffic source modeling.

CSE 552 Communication Network

Comprehensive in-depth introduction to communication networks with Emphasis on the internet and its access networks- but also covering the PSTN (public switched telephone network- wired and wireless) mobile Ad hoc networks- and Scada (supervisory control and data acquisition) Networks. Extensive examples of protocols and algorithms will be presented at all levels- including: client/server and peer-to-peer applications- Transport protocols- the end-to-end arguments and end-to-end congestion Control- network architecture- forwarding- routing- signaling- addressing- and traffic management. Prerequisites

CSE 553 Distributed Network and Internet Applications

The purpose of the distributed systems course is to learn the state-of-the-art of practical distributed systems and to distill design principles for building large network-based computational systems. Our readings and discussions will help us identify the research frontier and extract methods and general approaches to implement these advanced systems. The topics we will study include dynamic packet routing- global namespace systems- component architectures- Topologies- resource allocation strategies- distributed security and authentication protocols- fault-tolerant databases- distributed artificial intelligence- and virtual worlds. The course involves discussions of two or three papers a week and a large group project implementing a distributed system.

CSE 554 Wireless Computer Networks
Types of wireless networks, OSI layers of wireless networks, Interconnection of wireless networks, security of wireless networks, data transfer between wireless networks.

CSE 599 Research Project
Independent individual study or investigation of problems in a field related to the Diploma- under the supervisions of a faculty member.

Appendix (5)

Courses Description of Master Degree in Electronic Engineering (Level -600)

APPENDIX (5.1)

Department of Electronics and Electrical Communications Engineering

EEC 601 Image Processing

Theory and application of digital image processing - Multidimensional signal processing - Random- quantization- image compression- enhancement- restoration- segmentation- shape description- reconstruction of pictures from their projections- image enhancement- image restoration- image coding and encryption - image compression- Image processing circuits.

EEC 602 Medical Imaging Systems

Basic modalities used for imaging internal structures within the volume of the body from a systems viewpoint: x-ray radiography- computerized tomography- magnetic resonance- nuclear medicine- and ultrasound - Analysis of exciting and proposed systems in terms of resolution- modulation transfer function- detection sensitivity- noise ability to visualize disease processes- and potential for improving diagnosis- medical image processing.

EEC 603 Pattern Recognition

Basics of pattern recognition- feature extraction-methods of feature extraction- feature matching- face recognition – applications.

EEC 604 Adaptive Signal Processing and Applications

Theory of adaptive filters- Types of adaptive filters- application of adaptive filters in medical and speech signal processing- application of adaptive filters in smart antennas.

EEC 605 Speech Processing

Characteristics of speech signals- Mathematical models of speech and method of generation- speech analysis- speech synthesis- speech recognition- speech coding- speech encryption- speech compression- speech enhancement- speech processing circuits.

EEC 606 Discrete Transforms and Their Applications

Z- transform- Fourier transform- Wavelet transform – Curvelet transform- Walsh transform – Hadamard transform- Radon transform – Randlet transform- Fast implementation of discrete transforms- Applications of discrete transforms

in signal processing- image processing- antennas- microwave and digital communications.

EEC 607 Advanced Applications of Neural Networks

Principles of neural networks and its mathematical models- Applications of neural networks in pattern recognition- Enhancement of signals and images- compression of signals and images- Design of antennas- microwave components and optical components.

EEC 608 Spread Spectrum Communications

Introduction to direct sequence- frequency hopping- chirp and hybrid systems - processing gain - interference an jamming signals- Bit error rate performance - Pseudo-noise code generation - Synchronization and tracking techniques for DS and FH - Code Division Multiple Access - Applications in Military- satellite- indoor wireless and fading channels CDMA systems- CDMA system analysis- detection- equalization- Capacity analysis of CDMA systems.

EEC 609 Advanced Communication Systems

Wimax- Wi-Fi- Power line communications- CDMA systems- SDMA systems- Multi- input –multi- output (MIMO) systems- Wireless positioning systems- Bluetooth.

EEC 610 Modern Digital Modulation Systems

Review of ASK- BSK and FSK- m-ary ASK- PSK and FSK- Minimum shift Keying Modulation- Orthogonal Frequency Division multiplexing (OFDM)- Performance analysis of digital modulation systems for different channel types- Study of the effect of coding systems on the modulation technique.

EEC 611 Modern Coding and Encryption Systems

Source coding- Hamming- cyclic- convolutional- turbo and LDPC codes – Galois fields- channel coding- Dirty paper coding-Adaptive coding- Code design for digital systems- Performance analysis of different codes- Data encryption- image encryption.

EEC 612 Wireless Computer Networks

Network fundamentals- Configurations of wireless networks- wireless network layers- network protocols- Network Examples like ad hoc networks and infrared networks- performance analysis- data encryption and network security.

EEC 613 Optical Computer Networks

Network fundamentals- Configurations of optical networks- optical network layers- network protocols- Optical CDMA- wavelength division multiplexing WDM- performance analysis- data encryption and network security- Optical radio networks.

EEC 614 Propagation theory of Electromagnetic Waves

Basic electromagnetic theory- uniqueness theorem and boundary conditions. Electromagnetic potentials and Hertz vectors -Wave equation in different kinds of media including inhomogeneous- anisotropic and time varying - Plane wave in lossy dielectric media- Reflection and transmission - Surface waves - Propagation in ionized media - Propagation in layered media.

EEC 615 Microwave Devices and Circuits

General theory of waveguides- Inhomogeneous filling - Surface wave-guides. Periodic structures - Components. Scattering parameters representations - Passive microwave devices- directional couplers- filters- isolators and circulators - Six-port couplers - Microwave circuits – Microwave oscillators- microwave amplifiers- microwave mixers- Integrated microwave circuits. Laboratory measurements of the scattering parameters of some treated components and circuits.

EEC 616 Numerical Methods for Antennas

Numerical techniques for antennas - Solution of integral equations - Method of moments - conjugate gradient- fast Fourier transform and finite element boundary integral methods - High frequency methods - Applications including planar antennas- strip dipoles and patches- arrays- apertures- antenna synthesis and design - Computer implementations of some of the considered numerical methods- fractal antennas.

EEC 617 Advanced Antenna Engineering

Transmitting and receiving antennas-Linear and aperture antennas- Arrays - Coupling between elements - Broadband antennas -small antennas- fractal antennas - Antenna synthesis and design - Antenna measurements- Experimental investigation of antenna parameters such as gain- input impedance and patterns of selected antenna types.

EEC 618 Microwave Antennas

Equivalence principle and radiation potentials - Uniform and nonuniform illuminated apertures- Horn antennas - Curved surface reflector antennas-

paraboloid- spherical surfaces- shaped paraboloid and doubly curved surface reflector antennas- Ray optic methods and asymptotic techniques - Lens antennas. Microstrip antennas- Laboratory measurements of the parameters of some of the considered antennas.

EEC 619 Electromagnetic Scattering

Boundary condition- field representations - Low and high frequency scattering - Scattering by half plane (Wiener-Hopf method)- Edge diffraction- Scattering by cylindrical surfaces and spheres- Watson transformation-Airy-Fock functions- creeping waves - Geometrical and physical theory of diffraction.

EEC 620 Remote Sensing

Basic concepts - Airphoto- interpretation for terrain evaluation - Thermal and multi-spectral scanning -Microwave sensing - SAR -LIDAR- Earth resource satellites - Digital image processing.

EEC 621 Advanced Digital Integrated Circuits

Analysis and design of MOS and bipolar large-scale integrated circuits at the circuit level - Fabrication processes- device characteristics- parasitic effects and dynamic digital circuits for logic and memory functions - Calculation of speed and power consumption from layout and fabrication parameters- ROM. RAM- EEPROM circuits design - Use of SPICE and other computer aids.

EEC 622 Analog MOS Integrated Circuits

Fundamentals of analog MOS integrated circuit design - Small-signal device and circuit's models - Design of amplifiers- analog switches- sample and hold circuits- comparators and voltage reference - Analog subsystems- including A/D and D/A converters and switched capacitor filters.

EEC 623 Computer-Aided Design of Integrated Circuits

This course covers a wide variety of topics relating to the development of computer aids for integrated circuit design -It will emphasize the state-of-the-art techniques and both the theoretical basis for the methods as well as the application of results to practical problems- including details of implementation - Topics to be covered include simulation- layout techniques- synthesis- verification- testing- and integrated design systems- VHDL and Applications.

EEC 624 Biomedical Electronics Equipments

Nuclear Magnetic Resonance imaging and blood flow measurement principles - State-of-the-art techniques in medical instrumentation to measure parameters of

direct clinical significance- NMR- electron spin resonance- viscosity determinations Measurement and analysis of biopotentials and biomedical transducer characteristics- electrical safety- operational amplifiers for signal processing and computer interfacing -signal analysis and display on the laboratory minicomputer -Lectures and laboratory.

EEC 625 Advanced IC Processing and Layout

In depth treatment of device structures- fabrication technologies and circuit design issues in Integrated circuits-Optical - X-ray and e-beam lithograph- in implementation- oxidation and diffusion - Thin film deposition - Wet and dry etching and ion milling - Effect of phase and defect equilibria on process control.

EEC 626 Superconductive Devices and Circuits

Introduction to superconductivity - Electron pairing. BCS and Ginzburg-Landu theories - Single-particle and Josephson tunneling - Electrodynamics of superconductors and Josephson junctions - P:roximity effect - Mixed state in type II superconductors - Thin film - Applications in analog and digital circuits - Fabrication technology.

EEC 627 Teletraffic Engineering

Elements of teletraffic theory- traffic units and variations- dimensioning - Statistical description- traffic distributions- availability - Loss and delay systems- loss system overflow- grading - Link systems - Routing networks - Composite delay systems - Over- loading sensitivity.

EEC 628 Advanced Optical Communications

Overview of Optical Communications- Optical Fiber Power Launching and Coupling- Optical Receiver Operation- Photo Detectors and Preamplifiers- Point to Point Optical Links- Carrier to Noise Ratio- Optical Atmospheric Links- Progress in Optical Communications .

EEC 629 Advanced Communications Circuits

General electronic circuitry used in communication systems- mixers- up & down converters- PLL- filter design- attenuators- phase shifters- Hilbert transformers- hybrids - Carrier and clock recovery circuits - Pulse and timing circuits - Signal processing circuits-Switched capacitor circuits.

EEC 630 Statistical Communication Systems

Random processes and spectral densities- random signals through linear and nonlinear systems - Wide-sense stationary process and filtering- white noise- non-Gaussian distributions -The concepts of source- channel- and rate of transmission of information. Entropy- mutual information- and channel capacity- Source coding - Rate distortion theory - Noisy channels- the coding theorem for finite state memoryless channels - Markov chains. Applications.

EEC 631 Advanced Applications of Microprocessors

Microprocessors fundamentals - microprocessor architecture - Commands and programming - Assembly language - Types of interrupt signals - Interfacing micro processors with I/O units and circuits - Applications. Microprocessors applications in communications- Methodologies- tools- and practical experience in the design and implementation of digital systems using microprocessors- memories- and peripheral devices - Proposal- design- implementation- and evaluation of individual projects - Use of logic state analysis and microprocessor development stations.

EEC 632 Modern Radar and Sonar Systems

Radar fundamentals- physics and overview of electromagnetic scattering- exact prediction techniques- high frequency RCS prediction techniques- phenomenological examples of radar cross section- radar cross section reduction- radar absorbing materials- radar absorber measurement techniques- antenna RCS and RCSR –RCS measurement requirements- outdoor RCS test ranges- indoor RCS test ranges- high pocket RCS estimation- data presentation and reduction- Laser radar- ultrasonic radar- Sonar Systems.

EEC 633 Laser Systems

Propagation of laser beams: Gaussian wave optics and the ABCD law - Crystal properties and the dielectric tensor- Electro-optic effects and devices- Acousto-optic diffraction and devices - Introduction to nonlinear optics: coupled mode theory : and second harmonic generation- phase matching - Laser resonators- eigenmodes- and stability analysis- Rate equation analysis- Homogeneous and inhomogeneous broadening mechanisms- Laser gain and gain saturation- Q-switching and mode locking -Special topics: laser pulse compression- Raman and Brillouin scattering- phase conjugation.

EEC 634 Advanced Quantum Mechanics and Optical Electronics

The wave equation- Schrödinger equation: Steady state form-Particle in a box-Finite potential well-Tunnel effect- Harmonic Oscillator . The laser principles-

analysis of specific laser systems such as gas lasers- semiconductor lasers- and other solid-state lasers- laser dynamics- noise phenomena- nonlinear optics- guided wave optics- selected applications of coherent optics.

EEC 635 Optical Devices and Applications

Visible and infrared photo detectors- including PIN and avalanche photodiodes- photon counting devices and image intensifiers -imaging detectors- including vidicons and charge tupled Devices - display devices semiconductor lasers- tusto-optic- electro-optic- and waveguide modulators- flinonlinear optics- including second harmonic generation and optical bistability- Integrated optics.

EEC 636 Advanced Applications of Acoustic Devices

Basic principles- waves- propagation- impedance- reflection- trans- mission- attenuation- scattering- power levels -Generation of ultrasonic waves- transducers- focusing -Fraunhofer and. Fresnel zones - Instrumentation- display methods- Doppler techniques- signal processing. Industrial and medical applications will be emphasized.

EEC 637 Propagation of Sound Waves Under Water

Media characteristics for acoustic waves- Acoustic wave propagation underwater-Effects of media on acoustic waves- underwater imaging using acoustic waves- Applications.

EEC 638 Fabrication of Nanomatrials and nanostructures

Synthesis of Nanostructure:Principles of preparation-Nanomechanical structure generation- Nanolithography- Nanofabrication by scanning probe technique- Nanotechnical structure: Inorganic solids- Organic solids and layer structure- Molecular monolayer and architectures- Architectures with single molecules- Combination of molecular architectures and nanoparticle with planar technical structure.

EEC 639 Nano-Optics and Applications

Electron states in an ideal nanocrystal- General properties of spectrally inhomogenous media- Absorption and emission of light by semiconductor nanocrystals- Resonant optical nonlinearities- Interface effects.

EEC 699 Master's Thesis in Science Engineering

APPENDIX (5-2)

Department of Industrial Electronics and Control Engineering

(ACD 600) Statistical analysis

History - Etymology - Origins in probability - Important contributors to statistics - Conceptual overview - Statistical methods (Experimental and observational studies- Levels of measurement - Statistical techniques - Specialized disciplines - Statistical computing –applications.

(ACD 601) Advanced Programming using Matlab

Problem definition- data entry- variable assignment- method of solution- outputting data- graphics- m-files- c-languages with m-files- Control system tool box- filtering - neural network tool box- fuzzy logic tool box- robust control tool box- applications on filtering- neural networks- fuzzy logic controllers-etc.

(ACD 610) Linear systems

Introduction- controllability- observability- canonical forms- controllability canonical forms- types of real time systems-sequential control supervisory control- hardware and software requirements- Direct digital control- modeling of real time systems- controller design- real time operating systems- Applications.

(ACD 611) Optimal Control Systems

Controllability-observability-Calculus of variations- Pontryagin principle- optimal state feedback systems- output feedback systems- Riccati equation- optimal PID controllers- stability

(ACD 612) Stochastic Process Control

Stochastic processes- statistical analysis- correlation functions-classification of stochastic processes- Auto-regressive moving average models(ARMA) - smoothing-filtering – prediction- Filter design – Kalman filters – stability of stochastic systems- design of dual optimal control systems- (prerequisite ACD 600).

(ACD 613) Flight Automatic Control

Introduction- fluids- air-dynamics- degree of freedom -craft dynamics- altitude control – attitude control – multivariable control- disturbances- application of

different control on (optimal-adaptive-fuzzy-etc.) on flight systems.(prerequisite ACM 712).

(ACD 614) Wavelet and control

Wavelet theory - Continuous wavelet transforms - Discrete wavelet transforms - MRA-based discrete wavelet transforms - Mother wavelet - Comparisons with Fourier - Definition of a wavelet - Scaling filter - Scaling function - Wavelet function - Applications - Time line - Wavelet transforms - List of wavelets (Discrete wavelets - Continuous wavelets - Real valued - Complex valued) – control- Applications.

(ACD 615) Neural Networks Control

Introduction to artificial neural systems - artificial models-single layer perceptron classifier- multilayer feed forward networks-feedback networks-associative memories- Applications.

(ACD 616) Fuzzy logic control

Introduction to intelligent systems and their applications – Intelligent control systems and fuzzy logic – fuzzy sets-Fuzzy relations and fuzzy rules – Fuzzy relations and Compositional rule of inference – Fuzzy logic control – fuzzy associative memories- applications.

(ACD 617) Real time computer control

Introduction- types of real time systems-sequential control supervisory control-hardware and software requirements- Direct digital control- modeling of real time systems- controller design- real time operating systems- Applications.

(ACD 619)Selected topic in Automatic Control

This course should include the modern and the new scientific materials concerning the course- which is needed for students- Case study.

(ACD 620) Advanced Power electronics

DC/DC converter design -High-efficiency low-voltage high-current DC/DC Voltage Regulator Modules -Hard-switching and soft-switching DC/DC converters -DSP based distributed power system (DPS)- with current sharing techniques -Inverter technology for distributed generation - Dynamic modeling of switching mode power supplies - Low cost- high efficiency- AC/DC power supplies with power factor correction -Digital control using FPGA and DSP – Applications.

(ACD 621) Motor Drive Control
Introduction – soft starters- soft stop – breaking- speed drive systems – ratings – computer interfacing - programming – Applications.(prerequisite ACD 620)

(ACD 622) Advanced Programmable Logic Controllers and interfacing
Types of programmable logic controllers- programming using structured languages (GRAFCET) – Advanced functions A/D- D/A and PID and fuzzy logic controllers- networking of PLC's- PLC communications- SCADA in PLC- Applications.

(ACD 623) Digital Control of Electric Drive Systems
Introduction- sampling theorem- transfer function- state space- stability-controllers-PID- self-tuning- different modeling of electric drive systems- DC machines-Synchronous machine- induction machine.

(ACD 624) Advanced Industrial Control
Introduction- monitoring systems- cameras and switches-reordering based computer- programming-applications.

(ACD 625) Distributed systems and SCADA
Introduction- classical and advanced controllers- direct digital control-supervisory control- decentralized control-multilevel control- PLC system-computer system- communications- SCADA system-applications.

(ACD 626) Selected topic in industrial control
This course should include the modern and the new scientific materials concerning the course- which is needed for students- Case study.

(ACD 630) Advanced microcontrollers
Introduction- 8-bit microcontrollers-16-bit microcontrollers(specifications-architecture- programming) –high level language- development systems- fuzzy logic modules-DSP-applications.

(ACD 631) Mobile Robotics
Introduction- architecture and forms-specifications- motor drives-sensors(ultrasound-infrared-FM-contact)- vision-media- impact prevent-materials- programming-applications.

(ACD 632) Robots applications in manufacturing systems

Introduction- manufacturing system components(feeding-rotating tables-belt conveyer - rolling)- robot system in manufacturing – specifications – programming -applications.

(ACD 633) Time event Systems

Introduction- sequential machines- state graphs- Petri-nets(operations-properties- software packages) –GRAFCET(operations-properties- software packages)-programming- case study.

(ACD 634) Advanced mechatronics

Introduction- robust materials- CAD component design- advanced systems inspection-Emphasizes a system approach to design a global system- computer models- SCADA- - Applications.

(ACD 635) Integrated Manufacturing Systems

Introduction- manufacturing system layout- system planning- designing of individual units- designing of integrated system- computer control- supervisory control- programming-applications.

(ACD 636) Selected topic in mechatronics

This course should include the modern and the new scientific materials concerning the course- which is needed for students- Case study.

(ACD 637) Selected topic in robotics

This course should include the modern and the new scientific materials concerning the course- which is needed for students- Case study.

(ACD 699) Master of Science Thesis

APPENDIX (5-3)
Department of Computer Science and Engineering

CSE 601 Numerical Analysis
Numerical systems and errors. Gaussian elimination- lu decomposition- forward/ backward substitution. Diagonal systems- sparse matrices non quadratic systems- least squares method. Normal equations- gram-schmidt method. Recursive methods (jacobi- gauss-seidel- sor- ssor) numerical solution of nonlinear equations (secant method- bisection method- newton convergence)- Systems of nonlinear equations (secant method- bisection method- newton convergence) interpolation and approximation (lagrange- newton polynomial)- Spline interpolation- Numerical integration (trapezoidal- simpson's- gauss methods- romberg integration)- Numerical solution of differential equations (euler- runge-kutta methods).

CSE 602 Technical Language
learn general engineering terminologies and abbreviations. Also it learns how to write a scientific paper- The anatomy of the scientific paper- General Knowledge of engineering and an overview of electronic engineering systems.

CSE 603 Modeling and Simulation
Discrete event simulation- process scheduling approach- event scheduling approach- queuing theory- test signals- random number generators- model validation and verification- exposition to simulation packages- Case studies.

CSE 604 Expert Systems
Introduction: intelligent machines. Artificial intelligence- introduction to expert systems- Major characteristics of expert systems- expert system structure- characteristics of an expert system- conventional programming versus- Knowledge engineering- Knowledge representation- representation techniques- Logic inference techniques- rule based systems- Frame based expert systems- Knowledge acquisition.

CSE 605 Neural Networks
Introduction- models of neurons- network architecture- Learning process- error-correction learning- hebbian learning- supervised learning... Etc. Distributed memory mapping- correlation matrix memory- Perceptron convergence theorem- Multi-layer perceptrons- back-propagation algorithm- accelerated convergence- Case studies.

CSE 606 Multi-agent Systems

In the multi-agent course- various issues related to multi-agent systems are studied. In this course we study some multi-agent development methodologies as well as three programming languages and platforms that support the implementation of multi-agent systems. In particular- we study methodologies for specifying and designing multi-agent systems- 2apl- a practical agent programming language- jason- the programming language for multi-agent systems based on agentspeak- jadex- an bdi extension of jade which is java agent development framework.

CSE 607 Parallel Processing

Introduction to parallel processing. Organization-classification of parallel processing systems. Parallel processing applications- Shared memory systems- distributed memory systems- Speedup- efficiency- scalability- Amdahl's law- Parallel processing in array processors- pipeline machines- multiprocessors- dataflow machines- reduction machines- etc. Parallel programming languages- Multiprocessing in transputer systems-. Occam language- The tds system. Program execution in a transputer network. Blitzen machine- blitzen programming.

CSE 608 Database Management Systems

Introduction to database systems. Introduction to the concept of databases and their operations. Basic concepts- database architectures- storage structures And indexing- data structures: hierarchical- network- and relational database organizations. Emphasis on relational databases and retrieval language SQL. Theory of databases- normal forms- normalization- candidate keys- decomposition- functional dependencies- multivalued dependencies. Introduction to the design of a simple database structure and a data retrieval language.

CSE 609 Distributed Database Management Systems

Features of distributed versus centralized database. Distributed database management system. Architecture for distributed database- types of data fragmentation- distributed transparency for read only application- distributed transparency for update application- distributed database access primitives- integrity constrains. Distributed database design- Queries- Optimization of access strategies- Concurrency and reliability control.

CSE 610 Parallel Algorithms Design

Introduction and motivation- key concepts- performance metrics- scalability and overheads- Classification of algorithms- architectures and applications- searching- divide and conquer- data parallel. Static and dynamic- message passing and shared memory- systolic- Sorting and searching algorithms- mergesort- quicksort and bitonic sort- implementation on different architectures- Parallel depth-first and breadth-first search techniques- Matrix algorithms- striping and partitioning- matrix multiplication- linear equations- eigenvalues- dense and sparse techniques- finite element and conjugate gradient methods- Optimisation- graph problems- shortest path and spanning trees- Dynamic programming- knapsack problems- scheduling- Element methods- Synthesis of parallel algorithms- algebraic methods- pipelines- homomorphisms.

CSE 611 Mobile Communication Systems

The hardware building blocks of a radio-frequency communication system and the trade-offs encountered in their design- Algorithms and protocols that are suitable for use in high-speed mobile communication systems- The diverse quality of service requirements of modern mobile communication systems.

CSE 612 Computer Vision

Introduction to the basic concepts in computer vision. First- an introduction to low-level image analysis methods- including image formation- edge detection- feature detection- and image segmentation. Image transformations (e.g.- warping- morphing- and mosaics) for image synthesis- Methods for reconstructing three-dimensional scene information using techniques such as depth from stereo- structure from motion- and shape from shading. Motion and video analysis- Three-dimensional object recognition.

CSE 613 Multimedia Security

Classical approaches to security such as secure communications- cryptography- secure delivery- scrambling and internet/network security- intrusion detection and firewalls- Modern multimedia security- fundamentals of digital communications theory- Steganography: requirements- solutions and attacks (Stegoanalysis)- Robust Digital Watermarking and Tamper proofing.

CSE 614 Encryption Engineering

Introdution to some basic concepts and models. A quick look at conventional ciphers- aes- des and modern cryptanalysis- One-way functions- variants- one-way permutations- trapdoor functions- examples- rsa- discrete log- etc. Secure public-key encryption- passive security definitions- example systems- The hard-core bit theorem and connections to encryption- Digital signatures- hash functions- the hash-and-sign paradigm- tree-based authentication. Unconditional security- information theory- shannon's perfect security results- universal hashing and privacy amplification- key exchange over noisy channels- Key management- certificate systems- secret sharing.

CSE 615 Pattern Recognition

Formulation of the pattern recognition problem- statistical and syntactic approaches- parametric classifiers and bayesian decision- non-parametric classification- discriminate analysis- cluster analysis- recognition grammars- scene analysis.

CSE 616 Microprocessor Design

This course applies microprocessors as an integral element of system design. Techniques required for successful incorporation of microprocessor technology are studied and used. Hardware and software design considerations which affect product reliability- performance- and flexibility are covered. Students use hardware to gain familiarity with machine and assembly language for software generation- interfacing to a microprocessor at the hardware level- and emulation to check out system performance.

CSE 617 Advanced Computer Networks

Architecture of high speed network protocols- Inter-networking protocols with emphasis on new generation internet- Transport layer protocols with emphasis on performance issues- Application layer issues with emphasis on quality of service for multimedia applications.

CSE 618 Data Compression

The course includes a review of the major algorithms used in practical speech- audio- image and video coding- and describes the techniques used in the GSM and ITU speech coders- and the mpeg audio-visual coders.

CSE 617 Virtual Reality

Introduction to virtual environment system. Visual auditory- haptic environment system. Physiology and perception in virtual environments-

Intestrated and desktop vr systems. Distributed vr- systems. Software and operating shells for vr. Vr displays. Position and orientation tracking- Interaction with visual objects- Theory of light/object interaction- shadow generation. Texture mapping and modeling- Ray tracking- and animation techniques.

CSE 620 Advancec in Computer Science and Engineering

New directions on recent developments in computer science and engineering will be presented in this course. Course material will reflect the needs of the graduate students and their research activities.

CSE 621 Network Programming

Network programming course is divided into following three phases- basic concepts: introduction of environment and programming will be given to the students to revise their concepts about language- logic and networks. Advanced concepts: in this phase students will learn about the implementation of network application using sockets (TCP & UDP)- I/O models- socket options- remote procedure calls etc. Finally- present a comparative statement of different technologies used for the development of network applications and submit a comprehensive report along with presentation.

CSE 622 Digital Signal Processing

Properties of the digitized image- data structures for image analysis- image restoration- image segmentation- shape representation and description- object recognition- image understanding- discrete image transforms- image compression. Digital filter implementations- Digital signal processors- Numerical errors- Spectral analysis.

CSE 623 Optical Computers

Understanding of optical computer systems for processing- Topics include use of coherent optical systems for image processing and pattern recognition- principles of holography- and acousto-optic systems for radar-signal-processing optical computers. One dimensional Fourier analysis- two-dimensional Fourier analysis- followed by its application to optical systems analysis.

CSE 624 Embedded Systems

Overview of embedded systems and their design challenges- custom single-purpose processors- introduce general-purpose processors and their use- design a general-purpose processor- describes numerous standard single-purpose processors (peripherals) common in embedded systems. Introduce memories

and interfacing concepts- respectively- to complete the fundamental knowledge necessary to build basic embedded systems.

CSE 625 Real time system

Computer in industry- design of real time systems. Interfaces to external signals and devices. Serial communications- board-based micro computer systems - Introduction to programmable logic controllers. Programming using ladder diagram- programming languages - Plc hardware - Timers and counters - arithmetic functions - advanced programming techniques.

CSE 699 Master's Thesis in Science Engineering

Appendix (5.4)

Department of Physics and Engineering Mathematics

Qualification Courses Descriptions for Master Degree In Basic Science of Engineering

PME 501 Mathematical Analysis

Boolean algebra – mapping – denumerable sets – Fundamental Metric spaces – Continuous mapping – Limits and Cauchy sequences Compactness spaces – Space of continuous functions – Derivatives Formal rules of derivation – Theory of sets and functions – The real numbers axioms – Suprema and infima – The bounded functions axioms – Hilbert spaces – Calculus of differentiation and integration.

PME 502 Ordinary Differential Equations

Qualitative theory of ordinary differential equations – theory of existence and uniqueness of solutions – Stability theory – Periodic solutions – Limit cycles – Some applications on the oscillations theory.

PME 503 Linear Algebra

Linear transformations – Properties of Linear transformation – Kernel and range – Geometry of linear transformations – Matrices of linear transformations – Complex vector spaces.

PME 504 Operations Research

Classical optimization – Optimization of function of a single variable and multiple variables – Constrained optimization with inequality constraints – Search techniques – Unconstrained problems – One and multiple dimensional problems (simultaneous and sequential methods) – Variable types of mathematical programming.

PME 505 Functional Analysis

Normed spaces – Bach spaces – Hilbert spaces – Discrete solutions – Linear operators – Continuous operators – Spectrum theory – Non-linear operators in Banch spaces – Approximate discreet solutions of operator equation.

PME 506 Fluid Mechanics

Theory of fluids – Introduction of flow kinematics – Ideal fluid flow Two and three dimensional potential flow – Surface waves – Viscous flow of incompressible fluids – Boundary layer – Multi dimensional flow.

PME 507 Quantum Mechanics (1)

Introduction – Schrödinger equation – Solution of Schrödinger equation – Discrete and continuous spectrum of Schrödinger equation Some methods of approximate solution of Schrödinger equation Statistical interpolation of quantum mechanics – Linear harmonic oscillators – Perturbation theory of quantum mechanics – Theory of radiation – General theory of motion of a particle in a gentrally symmetric field.

PME 508 Equations of Mathematical Physics

Eigenfunction and Eingenvalue problems – Diffusion wave and distributions problems – Green's function – Integral transforms Dispersion and distribution – Theoretical methods for solving differential and integral equations and difference equations.

PME 509 Special functions

Gamma function – Beta function – Hermite function – Laguerre function – Legendre's polynomials – Tchebyshev polynomials Bessel functions.

PME 510 Applied Optical

Electromagnetic waves – Interference – Fraunhofer and Fresnel diffraction – Polarization – Optical crystals – Matrix optics – Laser beam and resonators – Guided waves fiber optics – Introduction to non-linear optics – Methods in engineering sciences – Fourier optics.

PME 511 Quantum Mechanics (2)

Introduction – Schrödinger equation – Solution of Schrödinger equation – Discrete and continuous spectrum of Schrödinger equation Some methods of approximate solution of Schrödinger equation Statistical interpretation of quantum mechanics – Linear harmonic oscillator – Perturbation of quantum mechanics – Theory of radiation General theory of motion of a particle in a generally symmetric field Solution of the simplest problems in spherical coordinates – Theory of hydrogen – Like Atoms (Keplers problem) – Hydrogen atom in an electric field – Scattering of particles by a Centre of force – Reggs method in scattering theory – Atoms in magnetic field.

PME 512 Laser and its Application

Atomic structure – Quantum transitions in atoms – Stimulated emission and amplification – Rate equation – Saturation – Feed back Coherent optical oscillation laser resonators – Dynamic and transient effects – Spicking – Q-switching – Frequency modulation – Laser spectroscopy – Nonlinear laser – Application in medical and communications.

PME 513 Plasma physics

Collision phenomena – Megnetohy drodynamic(MIID)– Macroscopic motion of plasma – Coublomb interactions – Plasma waves of small amplitude – Devices based upon punch effect and mirror – Like devices.

PME 514 Solid State Electronics

Electronic Energy bands – Semiconductor Crystals and Devices Superconductivity – Dielectric properties – Ferrorlectric crystals Diamagnetism and paramagnetism – Ferromagnetism and Antiferro magnetism – Electromagnetic crystals.

PME 515 Energy physics

Hydrogen atom – Nuclear energy sources – Nuclear fission and fusion Acelerators – Thermal performance of flat plate collectors – Thermal performance of concentrating collectors – Solar heating system Thermal energy storage.

PME 516 Atomic and Nuclear physics

Atomic structure – Thomson atom – Rutherford's theory of the scattering of alpha particles – The special theory of relativity –Michelson Morley experiment – The Compton effect – Hydrogen atom – Many electron atoms – Alpha decay-Beta decay and Gamma decay – Elementary particles – Nuclear reactions – Nuclear forces and nuclear structures.

PME 517 Theoretical physics

Introduction to quantum mechanics – Scattering – Currents and crossections – Particle and wave relation – Green function - Quantum mechanics – Angular momentum – Spin theory – Dirac equation The Phonon – Fermion .

PME 518 Statistical Thermodynamics

Introduction to statistical methods – Description of system of particles Statistical thermodynamics – Basic methods and results of statistical Mechanics – Maxwell-Boltzmann distribution – Simple application of statistical

mechanics – Quantum statistics (Bose-Einstein and Fermi–Dirac distribution) applications – System of interacting particles Transport phenomena.

PME 519 Introduction to computer

Logic functions – Boolean algebra – Logic function reduction and simplifications of Combinational circuits and systems – Sequential circuit and system – Sequential circuit and system – Programmable logic devices (PAL) – Microprocessor and Microcontroller –Computer programming languages – Application.

PME 520 Computer and Numerical Analysis

Introduction to computer– Introduction to programming –Applications of numerical analysis – Numerical integration and differentiation Solution to ordinary and partial differential equations – Solution of linear algebric equations – Curve fitting – Engineering applications.

PME 521 Materials Science

The behavior of real solid materials – Characterization of materials – Equilibrium phase – Non-equilibrium phase – Transformation – The response of materials to static and dynamic mechanical forces – Electromagnetic properties of materials – Nonferrous alloys – Glasses and amorphous materials – Nuclear materials – Response of materials to chemical environments – Polymers and polymerization.

PME 522 Engineering Statistics

Introduction to probability – Introduction to Statistics – Random variables – Discrete and continuous variables – Central tendency measurements – Dispersion measurements – Moment generating functions – Probability distributions and tables – Curve fitting and correlation – Test of hypothesis – Sampling test – Engineering applications.

Course Descriptions of Master Degree in Basic Science of Engineering

PME 623 Differential Equations (Linear- non- Linear- Partial)

Geometrical interpretation and solutions of ordinary differential equations - Linear ordinary differential equations with constant coefficients - Homogeneous and non-homogeneous linear differential equations with constant coefficients - Simultaneous equations - Euler's and Lagrange differential equations - Linear ordinary differential equations with non-constant coefficients - Theory of damped and free vibrations - Theory of damped forced vibrations - The wave equation in different dimensional equations - Laplac's equations in Cartesian- polar and cylindrical coordinates – Non-homogeneous partial differential equations.

PME 624 Differential Geometry

Theory of curves – Elementary topology in Euclidean space – Theory of surfaces (Regular-irregular- parametric- simple) – Topological characterization – Curvature and Torsion – Tensor analysis.

PME 625 Numerical Analysis (1)

Introduction – Theory of error – Approximation and interpolation of functions – splines-cubic algorithms – Algorithms of B-splines – one- two and three dimensional finite element analysis – Approximation using shape functions – Finite element methods – Numerical differentiation and integration – Mont Carlo method – Numerical methods for solving differential and integral equations.

PME 626 Introductory probability and Applications

Sample space and random variables – Conditional and marginal distributions – Special distributions – joint distributions (Bivariate and multinomial) – Limit theorems - Introduction to Marcov chains.

PME 627 Integral equations

Linear integral equations – Fredholm equation of first and second kind – Vollera equations of first and second kind – Singular integral equations – Well-posed and well-posed integral equations Approximate and numerical solutions of integral equations.

PME 628 Topology
Fundamentals of set theory – Singular homology and its application Chomology theory – Duality theory – Homotopy theory and its applications.

PME 629 Differential equations
Existence and uniqueness theory – Linear systems – Analytic systems Autonomous systems – Stability theory – Sturm-Liouville theory Introduction to partial differential equations – Solutions methods of boundary value problems – Solution methods of boundary value problems.

PME 630 Statistical physics
Quantum statistical mechanics – Quantization of scalar and dirac Field – Quantum Electrodynamics – Conformal field theory Statistical mechanics for gasses – Transport phenomena Computational physics.

PME 631 Solid state physics
Crystal structure – Crystal diffraction and reciprocal – Elastic constants and Elastic waves – Crystal binding – Phonons and lattice vibrations – Conductivity at high frequency – Plasmas – Cohesive energy – Thermion emission – Energy bands – Semiconductor crystal Fermi-Surfaces and metal.

PME 632 Optical properties of Nano crystal
Electron states in ideal nanocrystals- Growth of nanocystals – General properties of spectrally inhomogeneous media- Absorption and emission of light by nanocrystals – Resonant optical nonlinearities and related many body effects – lnterface effects.

PME 633 Spectroscopy
Uses of spectroscopy – Atomic structure – Molecular structure – Light sources and detectors – Dispersion and resolving power – Diffraction grating interfometers – Laser spectroscopy – Emission and absorption lines relation.

PME 634 Electromagnetic field theory
Vector analysis – Electrostatics – Value problems in electrostatics multiple – Electrostatics of macroscopic media – Dielectrics Magnetostaties – Magnetic energy.

PME 635 Superconductivity theory
Conventional superconductors – Structure and phases of super- conductors normal state properties – Superconducting state properties BCS theory magnetic properties – Vortex behavior – Applications.

PME 636 Crystallography
Crystal structure – Translation vectors – Lattices – Unit cell – Plances and vectors – Simple crystal structure - Nonideal crystal Reciprocal structure – Miller indices – Brillouin zones – Binding in crystals.

PME 637 General engineering chemistry
Atoms and molecules – Chemical bonds – Types of attraction forces between molecules – Distillation and Extraction – Extraction states of matter – Solutions – Analytical chemistry – Metals – Ceramics and Polymers – Electrochemistry – Dielectric materials.

PME 699 Thesis of Master of Science in Engineering

APPENDIX (6)

Course Descriptions of Doctor of Philosophy Degree in Electronic Engineering (Level 700)

APPENDIX (6.1)

Department of Electronics and Electrical communications Engineering

EEC 701 Advanced Techniques in Image Processing
Digital image representation- 2-D discrete transforms and applications- Image enhancement- Image restoration- image super resolution- image interpolation- image coding- image encryption- image segmentation – image classification- multimedia processing – image transmission over wireless channels- Advanced applications.

EEC 702 Analysis of Medical Images
Fundamentals of medical imaging- X-ray imaging- magnetic resonance imaging- ultrasonic imaging- CT imaging- infrared imaging- Positron emission imaging– atomic scans- Processing of medical images- fusion of medical images.

EEC 703 Applications of Pattern Recognition
Fundamentals of pattern recognition- feature extraction- feature matching – Hidden Markov models- Application of neural networks in pattern recognition– Pattern recognition in satellite images– pattern recognition in infrared images – speech recognition- Advanced applications.

EEC 704 Applications of Adaptive Filters
Fundamentals of adaptive filters- Adaptive Wiener Filters- Adaptive Kalman Filters- Adaptive Lattice Filters- Realization of adaptive filters- Application of adaptive filters in medical and speech signal processing- Applications of adaptive filters in image processing- applications of adaptive filters in digital communication systems- application of adaptive filters in smart antennas application of adaptive filters in optical communication systems.

EEC 705 Advanced Techniques of Speech Processing
Fundamentals of speech signal processing- Spectral estimation of speech signals- Applications of digital filters in speech processing- speech analysis- speech synthesis-speech feature extraction- Hidden Markov models in speech processing- speech recognition- speech coding- speech encryption- speech compression- speech enhancement- speech watermarking- speech processing circuits.

EEC 706 Discrete Mathematics and Applications

Difference equations- Application of Z- transform signal processing- Discrete Fourier transform and applications- Applications of Wavelet transform in signal and image processing– Application of Curvelet transform in image processing – Application of Walsh and Hadamard transforms in digital communication- Application of Radon and Randlet transforms in signal and image processing- Fast implementation of discrete transforms- Applications of discrete mathematics in antennas and microwave engineering.

EEC 707 Applications of Neural Networks in Communication Systems

Mathematical models of neural networks- Performance analysis of neural network models- Application of neural networks in mobile communication- Applications of neural networks in pattern recognition- Application of neural networks in signal and image processing- Application of neural networks in antenna and microwave design- Application of neural networks in optical component design.

EEC 708 Code Design for Spread Spectrum Communications

Spread Spectrum systems- CDMA systems- CDMA system analysis- detection- equalization- Code design for CDMA systems – Code design for optical CDMA systems- Performance analysis of CDMA systems with different codes.

EEC 709 Performance Analysis of Advanced Communication Systems

Performance study of Wimax and Wi-Fi systems – Performance study of Power line communications- Performance study of CDMA systems- Performance study of SDMA systems- Performance study of Multi- input –multi- output (MIMO) systems- Performance study of Wireless positioning systems- Performance study of Bluetooth systems.

EEC 710 Performance Analysis of Digital Modulation Systems

Fundamentals of Digital Modulation Systems- Orthogonal Frequency Division multiplexing systems (OFDM)- Performance analysis of digital modulation systems for different channel types- Study of the effect of coding systems on the modulation technique.

EEC 711 Analysis and Design of Coding and Encryption Systems

Channel Coding- Source coding- Hamming- cyclic- convolutional- turbo and LDPC codes – Galois fields- Dirty paper coding-Adaptive coding- Code design

for digital systems- Performance analysis of different codes- Data encryption- image encryption.

EEC 712 Performance Analysis of Wireless Computer Networks
Configurations of wireless networks- wireless network layers- network protocols- Network Examples like ad hoc networks and infrared networks- performance analysis- data encryption and network security.

EEC 713 Performance Analysis of Optical Computer Networks
Configurations of optical networks- optical network layers- network protocols- Optical CDMA- wavelength division multiplexing WDM- performance analysis- data encryption and network security- Optical radio networks.

EEC 714 Propagation of Electromagnetic Waves
Basic electromagnetic theory- uniqueness theorem and boundary conditions. Electromagnetic potentials and Hertz vectors -Wave equation in different kinds of media including inhomogeneous- anisotropic and time varying - Plane wave in lossy dielectric media- Reflection and transmission - Surface waves - Propagation in ionized media - Propagation in layered media.

EEC 715 Performance Analysis of Microwave Devices and Circuits
General theory of waveguides; Inhomogeneous filling - Surface wave-guides. Periodic structures - Components. Scattering parameters representations - Passive microwave devices; directional couplers- filters- isolators and circulators - Six-port couplers - Microwave circuits – Microwave oscillators- microwave amplifiers- microwave mixers- Integrated microwave circuits. Laboratory measurements of the scattering parameters of some treated components and circuits.

EEC 716 Advanced Numerical Methods for Antennas and microwave
Numerical techniques for antennas - Solution of integral equations - Method of moments - conjugate gradient- fast Fourier transform and finite element boundary integral methods - High frequency methods - Applications including planar antennas- strip dipoles and patches- arrays- apertures- antenna synthesis and design - Computer implementations of some of the considered numerical methods- fractal antennas.

EEC 717 Advanced Antenna Systems
Transmitting and receiving antennas-Linear and aperture antennas- Arrays - Coupling between elements - Broadband antennas -small antennas- fractal

antennas - Antenna synthesis and design - Antenna measurements- Experimental investigation of antenna parameters such as gain- input impedance and patterns of selected antenna types.

EEC 718 Design of Microwave Antennas

Equivalence principle and radiation potentials - Uniform and nonuniform illuminated apertures- Horn antennas - Curved surface reflector antennas- paraboloid- spherical surfaces- shaped paraboloid and doubly curved surface reflector antennas- Ray optic methods and asymptotic techniques - Lens antennas. Microstrip antennas- Laboratory measurements of the parameters of some of the considered antennas.

EEC 719 Theory of Electromagnetic Scattering

Boundary condition- field representations - Low and high frequency scattering - Scattering by half plane (Wiener-Hopf method)- Edge diffraction- Scattering by cylindrical surfaces and spheres- Watson transformation-Airy-Fock functions- creeping waves - Geometrical and physical theory of diffraction.

EEC 720 Applications of Remote Sensing

Basic concepts – Airphoto- interpretation for terrain evaluation - Thermal and multi-spectral scanning -Microwave sensing - SAR -LIDAR- Earth resource satellites - Digital image processing.

EEC 721 Design Methods for Digital Integrated Circuits

Analysis and design of MOS and bipolar large-scale integrated circuits at the circuit level - Fabrication processes- device characteristics- parasitic effects and dynamic digital circuits for logic and memory functions - Calculation of speed and power consumption from layout and fabrication parameters- ROM. RAM- EEPROM circuits design - Use of SPICE and other computer aids.

EEC 722 Design of Analog MOS Integrated Circuits

Fundamentals of analog MOS integrated circuit design - Small-signal device and circuit's models - Design of amplifiers - analog switches- sample and hold circuits- comparators and voltage reference - Analog subsystems- including A/D and D/A converters and switched capacitor filters.

EEC 723 Advanced Techniques for Computer-Aided Design of Integrated Circuits

This course covers a wide variety of topics relating to the development of computer aids for integrated circuit design -It will emphasize the state-of-the-art

techniques and both the theoretical basis for the methods as well as the application of results to practical problems- including details of implementation - Topics to be covered include simulation- layout techniques- synthesis- verification – testing - and integrated design systems- VHDL and Applications.

EEC 724 Performance Study of Biomedical Electronic Equipments

Nuclear Magnetic Resonance imaging and blood flow measurement principles - State-of-the-art techniques in medical instrumentation to measure parameters of direct clinical significance- NMR- electron spin resonance- viscosity determinations Measurement and analysis of biopotentials and biomedical transducer characteristics; electrical safety- operational amplifiers for signal processing and computer interfacing -signal analysis and display on the laboratory minicomputer -Lectures and laboratory.

EEC 725 Advanced IC Design

In depth treatment of device structures- fabrication technologies and circuit design issues in Integrated circuits-Optical - X-ray and e-beam lithograph- in implementation- oxidation and diffusion - Thin film deposition - Wet and dry etching and ion milling - Effect of phase and defect equilibria on process control.

EEC 726 Design of Superconductive Circuits

Introduction to superconductivity - Electron pairing. BCS and Ginzburg-Landu theories - Single-particle and Josephson tunneling - Electrodynamics of superconductors and Josephson junctions - P-roximity effect - Mixed state in type II superconductors - Thin film - Applications in analog and digital circuits - Fabrication technology.

EEC 727 Capacity Analysis of Communication Systems

Elements of teletraffic theory- traffic units and variations- dimensioning - Statistical description- traffic distributions- availability - Loss and delay systems- loss system overflow- grading - Link systems - Routing networks - Composite delay systems - Over- loading sensitivity.

EEC 728 Advanced Techniques in Optical Communications

Overview of Optical Communications- Optical Fiber Power Launching and Coupling- Optical Receiver Operation- Photo Detectors and Preamplifiers- Point to Point Optical Links- Carrier to Noise Ratio- Optical Atmospheric Links- Progress in Optical Communications .

EEC 729 Analysis and Design of Communications Circuits
General electronic circuitry used in communication systems; mixers- up & down converters- PLL- filter design- attenuators- phase shifters- Hilbert transformers- hybrids - Carrier and clock recovery circuits - Pulse and timing circuits - Signal processing circuits-Switched capacitor circuits.

EEC 730 Advanced Statistical Communication Systems
Random processes and spectral densities- random signals through linear and nonlinear systems - Wide-sense stationary process and filtering- white noise- non-Gaussian distributions -The concepts of source- channel- and rate of transmission of information. Entropy- mutual information- and channel capacity- Source coding - Rate distortion theory - Noisy channels; the coding theorem for finite state memoryless channels - Markov chains. Applications.

EEC 731 Applications of Microprocessors in Communication Systems
Microprocessors fundamentals - microprocessor architecture - Commands and programming - Assembly language - Types of interrupt signals - Interfacing micro processors with I/O units and circuits - Applications. Microprocessors applications in communications- Methodologies- tools- and practical experience in the design and implementation of digital systems using microprocessors- memories- and peripheral devices – Proposal- design- implementation- and evaluation of individual projects - Use of logic state analysis and microprocessor development stations.

EEC 732 Advanced Techniques in Radar and Sonar Systems
Radar fundamentals- physics and overview of electromagnetic scattering- exact prediction techniques- high frequency RCS prediction techniques- phenomenological examples of radar cross section- radar cross section reduction- radar absorbing materials- radar absorber measurement techniques- antenna RCS and RCSR –RCS measurement requirements- outdoor RCS test ranges- indoor RCS test ranges- high pocket RCS estimation- data presentation and reduction- Laser radar- ultrasonic radar- Sonar Systems.

EEC 733 Design of Laser Systems
Propagation of laser beams- Gaussian wave optics and the ABCD law - Crystal properties and the dielectric tensor- Electro-optic effects and devices- Acousto-optic diffraction and devices - Introduction to nonlinear optics coupled mode theory and second harmonic generation- phase matching - Laser resonators- eigenmodes- and stability analysis- Rate equation analysis- Homogeneous and inhomogeneous broadening mechanisms; Laser gain and gain saturation- Q-

switching and mode locking -Special topics- laser pulse compression- Raman and Brillouin scattering- phase conjugation.

EEC 734 Applications of Quantum Mechanics

The wave equation- Schrödinger equation- Steady state form-Particle in a box-Finite potential well-Tunnel effect- Harmonic Oscillator . The laser principles; analysis of specific laser systems such as gas lasers- semiconductor lasers- and other solid-state lasers; laser dynamics- noise phenomena- nonlinear optics-guided wave optics- selected applications of coherent optics.

EEC 735 Design of Optical Devices and Components

Visible and infrared photo detectors- including PIN and avalanche photodiodes-photon counting devices and image intensifiers -imaging detectors- including vidicons and charge tupled Devices - display devices semiconductor lasers-tusto-optic- electro-optic- and waveguide modulators; flinonlinear optics-including second harmonic generation and optical bistability- Integrated optics..

EEC 736 Design of Acoustic Devices and Components

Basic principles; waves- propagation- impedance- reflection- trans- mission-attenuation- scattering- power levels -Generation of ultrasonic waves; transducers- focusing -Fraunhofer and. Fresnel zones - Instrumentation; display methods- Doppler techniques- signal processing. Industrial and medical applications will be emphasized.

EEC 737 Propagation of Sound Waves Under Water

Media characteristics for acoustic waves- Acoustic wave propagation underwater-Effects of media on acoustic waves- underwater imaging using acoustic waves- Applications.

EEC 738 Advanced Techniques for Nano material Fabrication

Synthesis of Nanostructure-Principles of preparation-Nanomechanical structure generation- Nanolithography- Nanofabrication by scanning probe technique-Nanotechnical structure- Inorganic solids- Organic solids and layer structure-Molecular monolayer and architectures- Architectures with single molecules-Combination of molecular architectures and nanoparticle with planar technical structure.

EEC 739 Applications of Optical Properties of Nano material

Electron states in an ideal nanocrystal- General properties of spectrally inhomogenous media- Absorption and emission of light by semiconductor nanocrystals- Resonant optical nonlinearities- Interface effects.

EEC 799 Ph. D. Thesis

APPENDIX (6.2)

Department of Industrial Electronics and Control Engineering

(ACD 711) Large Scale Systems
Introduction – optimal control- Centralized systems- decentralized systems- aggregation- decomposition- decoupling - multilevel control- hierarchical control- stability- applications.

(ACD 712) Fuzzy modeling
Introduction – overview of fuzzy sets and fuzzy systems – modeling data - fuzzy operators for constructing models – model representation – choosing the membership functions – representing the model output – creating fuzzy sets – comparisons – applications.

(ACD 713) Neuro-Fuzzy systems
Introduction- classical methods- Fuzzy Systems - fuzzy' boundaries of linguistic -preference- and uncertainty - Neural Networks- learning rules - development of architectures and learning algorithms - Combining Neural Networks and Fuzzy Systems -Recurrent Neuro-Fuzzy Systems – applications.

(ACD 714) Stability Theory
Introduction - linear systems – feedback nonlinear systems - Lyapunov stability criteria – hyper stability – positivity of systems.

(ACD 715) Robust control
Introduction to optimal control – Mathematic over view – inner-product space – Hilbert space - single value decomposition – frequency domain analysis – H-infinity – Applications.

(ACD 719) Selected Topics in automatic control
This course should include the modern and the new scientific materials concerning the course- which is needed for students- Case study.

(ACD 720) Advanced Microcontrollers and DSP
Introduction – 16-bit microcontrollers- architecture and operations- interfacing- programming- communications- development systems – DSP- architecture- operation- interfacing – programming- communications- development systems – applications on- filtering- neural networks- fuzzy logic controllers- etc.

(ACD 721) Advanced Programmable Logic Controllers and DCS
Introduction – PLC background – Advanced functions A/D- D/A and PID and fuzzy logic controllers- advanced communications- SCADA in multi PLC system- DCS architecture- operations- programming - Applications.

(ACD 722) Advanced Electrical Drive machines
Advanced IGBT- 6-and 12 transistors inverters – multi-transistor circuits-drive circuits- microcontroller drive circuits - protection – applications.

(ACD 723) Applications Of DSP in Electrical machine Control
Introduction- DSP capabilities- DC machines- induction motors overview- direct control- inverse cosines control- field-oriented control- controllers degree of freedom – PID controllers- application of fuzzy logic controllers - neural controllers.

(ACD724) Fuzzy logic control in Electric drive systems
Over view of fuzzy logic controllers- Fuzzy logic DC motor control – fuzzy logic control in induction machines – fuzzy logic control in reluctance motors – Applications.

(ACD 725) Renewable energy
Thermal Solar systems (Heating- Cooling and Ventilation) – photovoltaic solar systems - Types of technologies - Architecture - Solar Power Plants - Solar chemical - Energy storage - Solar Vehicles – Wind energy - Wind variability and turbine power - Turbine placement - Utilization - Theoretical potential - Economics and feasibility - Intermittency and variability - Energy storage - Predictability - Ecology and pollution - Power generation – power electronics- applications.

(ACD 726) Automatic Control in Automotive Systems
Comfortably control- suspensions control- ABS systems- fuel control- speed control – steering control– PID – Neural networks – sliding mode control – fuzzy logic – applications.

(ACD727) Computer Applications In Electrical Power Engineering
Introduction- power system modeling - Load flow problems- voltage control- speed control/frequency control- load disturbances- load control- PID and fuzzy controllers. Applications

(ACD 728) Electric Drive control in automotive
Sensors -DC motors and drives- power electronics- ignition systems- steering control- suspension control - actuators- microcontrollers- applications.

(ACD 729) Selected Topics in Industrial Electronics Engineering
This course should include the modern and the new scientific materials concerning the course- which is needed for students- Case study.

(ACD 730) Digital image processing
Introduction-image representation (1D and 2D) – image operations (filters- rotation – edge detection….etc.) – image enhancement - image restoration – image understanding – application.

(ACD 731) Advanced automata systems
Introduction to time event systems- state diagrams – sequential machines – test of logic machines – regular expressions- Petri-nets - GRAFCET- multilevel networks- fuzzy Petri-nets- Applications.

(ACD 732) Mems and Fems Technology
Mechanical elements – micro sensors – micro actuators – construction – materials fabrications-development of smart product – microelectronics in mems -environmental control- total measurements - functionality – reliability – sophistications- applications.

ACD 733 Expert systems in Robotics control
Introduction- robotic perception- localization – mapping – configuration space - robot vision – pattern recognition – speech analysis – applications.(prerequisite ACD 730).

(ACD 734) Robots cooperation
Robot characteristics – robot spaces- two robots cooperation- three robot cooperation- killing avoidance – programming- vision- inelegance- control- applications.

(ACD 735) Robot imaging
Camera system – one camera and two-camera system - wireless camera – space view- end effector view – calculation of space values – pattern recognition – applications. (prerequisite ACD 730).

(ACD 636) Flexible Manufacturing Systems

Introduction –design of individual machines-complete machine for manufacturing- maintainability and functionality- Emphasizes a system approach to design- computer models- component design- Applications.

(ACD 637) Flexible link robots

Introduction - Construction and design- Materials – degree of freedom - actuators – sensors – computer interface – camera system – single link arm – double link arm - vibration- dynamics and control- stability - applications.

(ACD738) Selected topic in mechatronics

This course should include the modern and the new scientific materials concerning the course- which is needed for students- Case study.

(ACD739) Selected topic in robotics

This course should include the modern and the new scientific materials concerning the course- which is needed for students- Case study.

(ACD 799) Ph. D. Thesis

APPENDIX (6.3)

Department of Computer Science and Engineering

CSE 700 Technical Language
learn general engineering terminologies and abbreviations- Also it learns how to write a scientific paper- The anatomy of the scientific paper- General Knowledge of engineering and an overview of electronic engineering systems.

CSE 701 Advanced Digital Engineering Systems
Synthesis of asynchronous sequential circuits - state and flow tables - compatible states- reduction. Race free state assignment- Msi components- adders- encoders and decoders- comparators- multiplexers- registers- roms- counters- Programmable logic- plas- plds- prom-. Algorithmic state machines- asm charts- timing- implementation. Hardware description languages.

CSE 702 Advanced Database Systems
Review of relational database systems Object-oriented systems (ER- EER- OO models- EER to OO mapping design of OODBS- physical level issues)- Parallel and distributed databases (client /server architecture- data fragmentation- query processing of optimization- transaction processing)- Temporal databases- Geographic information systems- Deductive databases- Information retrieval systems- Content based retrieval and special access methods.

CSE 703 Data Warehouse
Design and build comprehensive Data Warehousing solutions- Implement special data modeling techniques and define metadata- Developing a data model & generating a multidimensional database using Erwin. Generate and maintain database objects such as Tables- Primary Key- Foreign Key- Unique Key- Indexes- Views- and Triggers etc. using Erwin. Define Extraction- transformation and loading (ETL) process and use ETL tool to load data into data warehouse- develop Business Intelligence (BI) solutions- Transformer and Power Play- Deploy Report by IWR (Impromptu Web Reports) and publish Cubes by PPES (Power Play Enterprise Server)- Optimize Data Warehouse performance.

CSE 704 Advanced Data Structure and Algorithms
The course demonstrates the use of main algorithm analysis techniques such as recurrences and amortized analysis. Using algorithms from different areas of

computer science- main algorithm design techniques are presented- including divide-and-conquer- greedy algorithms- dynamic programming- heuristic algorithms- and approximation algorithms. The algorithms covered span areas such as external memory algorithms and data structures- text search and pattern matching- advanced graph algorithms- heuristic search- and computational geometry algorithms and data structures

CSE 705 Computer Game Programming

In this course we will study the technology- science- and art involved in the creation of computer games. The course will emphasize hands-on development of games. Study a variety of software technologies relevant to games including programming languages- scripting languages- operating systems- file systems- networks- simulation engines- and multi-media design systems. Some of the underlying scientific concepts from computer science and related fields including- simulation and modeling- graphics- artificial intelligence- real-time processing- and game theory. Finally- we will study the art and design principles for developing useable and engaging games including- software engineering- human computer interaction- thematic structure- graphic design- choreography- music and sound effects- and game aesthetics.

CSE 706 Network Security

Introduction to the basic concepts- components- protocols- and software tools to achieve secure communication in a public network. The concept of encryption- integrity verification- authentication- security models- and the robustness analysis. Emphasis on the application level protocols and vulnerabilities- firewalls- viruses- worm attack- Trojan horses- password security- secure multicast - biometrics- VPNs- internet protocols such as SSL- IPSEC- PGP- and SNMP. The policies for access control- user privacy- and trust establishment and abuse in open environments.

CSE 707 Watermarking and Data Hiding

Overview of watermarking. Embedding a Digital Watermark- State-of-the-art Digital Watermarking Techniques- Protecting data during transit - Robustness- perceptual quality- payload (and security)- Steganography and encryption used in data hiding- the detection or destruction of steganographic content and software- Demonstration of hiding data in standard word processing and sound files using no special software tools. The protection of confidential business activities.

CSE 708 Cryptography and Encryption Algorithms

Introduction to the mathematical background- basic concepts- components- and protocols to enforce secrecy- integrity- and privacy through cryptographic mechanisms. The concept of symmetric and asymmetric encryption- integrity verification- authentication- key establishment and update- and authorization. Emphasis on the design of protocols that apply and integrate various modules To achieve safety objectives- time-stamping- digital signature- bit commitment- Fair coin-flip- zero knowledge proof- oblivious transfer- and digital cash. The policies for key generation and management- information storage and access control- legal issues- and design of protocols for real applications.

CSE 709 Digital Signatures

Definition- history- benefits of digital signatures such as authentication- integrity. Drawbacks of digital signatures- association of digital signatures and trusted time stamping- non-repudiation Additional security precautions- putting the private key on a smart card- using smart card readers with a separate keyboard- other smart card designs- using digital signatures only with trusted applications. Some digital signature algorithms- the current state of use — legal and practical and using separate key pairs for signing and encryption.

CSE 710 Advanced Computer Architecture

Hardware and software components. Data types- The instruction set- Instruction- types- instruction format- Op-code encoding- Addressing modes- Memory organization- virtual memory- memory hierarchy- memory access control- Arithmetic and logical unit- arithmetic functions realization- control unit- hardware realization of control unit- Micro programming- Computer interfacing- Input / output devices- Input / output buffering- Secondary storage devices- DMA and DASD devices- Non congenital computer architectures. Parallel and pipeline processing.

CSE 711 Data Compression

This course will cover a broad range of lossless and lossy compression techniques- as well as explain some of the practical implementations of these techniques that are in widespread use today- An emphasis will be placed on learning techniques- so that one can easily learn specific compression standards- and the reasons behind the design of the standards- This course will cover compression of all types of data- including text- images- video- and audio. Some of the techniques covered include block-based coding- dictionary coding- predictive coding- vector quantization- and transform coding (including wavelets).

CSE 712 Distributed Systems

The purpose of the Distributed Systems course is to learn the state-of-the-art of practical distributed systems and to distill design principles for building large network-based computational systems. Our readings and discussions will help us identify the research frontier and extract methods and general approaches to implement these advanced systems. The topics we will study include dynamic packet routing- global namespace systems- component architectures- ontologies- resource allocation strategies- distributed security and authentication protocols- fault-tolerant databases- distributed artificial intelligence- and virtual worlds. The course involves discussions of two or three papers a week and a large group project implementing a distributed system.

CSE 713 ISDN

This course provides a working knowledge of isdn concepts- terms- and Principles. It explains how isdn addresses the needs for higher-speed network Connections and the movement away from analog connectivity to digital connectivity- describe the model and components that make up the isdn interfaces and reference points. Identify the more specialized applications for isdn- including dial-on-demand routing applications- video applications- credit card and automated teller applications- and distance learning. Explain two dial back-up configuration options- backup statement configuration- and floating static route configuration.

CSE 714 Operation Research

Formulation- solution techniques- and sensitivity analysis for optimization problems which can be modeled as linear- integer- network flow- and dynamic programs. Use of software packages to solve linear- integer- and network problems.

CSE 715 Data Mining

Introduction to the general principles of inferring useful knowledge from large data sets (commonly known as data mining or knowledge discovery)- Relevant concepts from statistics- databases and data structures- optimization- artificial intelligence- and visualization are discussed in an integrated manner- Visualization Techniques- Exploratory Data Analysis- Uncertainty and Statistics- Presentation of Data Sets- Models and Patterns- Score Functions- Optimization and Search- Classification Algorithms- Clustering Algorithms- Data Management Principles.

CSE 716 Advances in Computer Science and Engineering
Selected oriented topics on recent developments in computer science engineering will be presented in this course- Course material will reflect the needs of the graduate students and their research activities.

CSE 717 Multimedia Compressions
Understanding of what video compression is and why it is necessary- Understand the differences between commonly used codecs- and when to apply them- Where compressed files are viewed- definition of compression- why compression is important; a computer is not a TV- ways of reducing video file size- commercial codecs- what they are- how they work and which to use for different outputs- choosing a file format- Preparing a file using the Wizard. Prepare a video for the web. Crop and prepare a video for a PowerPoint presentation. Demonstration- How to change specific compression parameters- compressing multiple files in a batch.

CSE 799 PhD Thesis

Appendix (6-4)

Department of Physics and Engineering Mathematics

Course Descriptions of Doctor of Philosophy Degree In Basic Science of Engineering

PME 701 Probability and statistics
Time series – Sampling distributions – Estimation – Analysis of variance – Statistical Quality control.

PME 702 Operations Research (2)
Queuing systems with combined arrival and departure processes Priority queues - Network queues.

PME 703 Nonlinear differential equations
Different methods for solving nonlinear differential equations analytically.

PME 704 Numerical analysis (2)
Numerical solution of ordinary Differential equations (linear and non-linear) and partial differential equations.

PME 705 Function Analysis (2)
Space- L1- L2- Lp and its applications.

PME 706 Solid state electronics
Crystallography – Elements of quantum mechanics – Structure of quantum bundles – Effective mass – Photons – Relaxation times Diffusion – Recombination – Absorption – Emission – Transfer equations – Semiconductor junctions – Semiconductor tunneling Electromagnetic radiation in solids.

PME 707 Optoelectronic semiconductors
General view of optical properties in semiconductors – Diffusion elements of plain wave – Theory and design of light emission diodes Laser diodes and detectors – Electromagnetic spectrum and energy level transmissions – Spontaneous and stimulated emission.

PME 708 Solar cells

Solar radiation – ideal conversion efficiency – optical absorption and reflection in semiconductors – P-N junction solar cells Hetrojunctions and classification of solar cells- Solar arrays.

PME 709 Nano technology

Preparation of nanostructure – Nanotechnical structure Characterization of nanostructure – Nanolectronis devices Nanooptices – Nanostructure as optical sensors – Nanooptiching.

PME 799 Ph.D. Thesis in Basic Science Engineering