CURRICULUM OF DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

First Semester					
CODE	COURSE NAME	T	P	C	ECTS
MTH 103	Linear Algebra	3	0	3	4
CEN 111	Introduction to Algorithms & Programming	3	2	4	7
ELT 101	Development of Reading And Writing Skills In English I	2	2	3	6
PHY 101	General Physics I	3	2	4	6
MTH 101	Calculus I	3	2	4	7
XXX xxx	Non Technical Elective	0	2	0	0
	Total	14	10	18	30

Second Semester					
CODE	COURSE NAME	T	P	C	ECTS
EEE 102	Introduction to Electrical Engineering	3	0	3	6
ELT 102	Development of Reading And Writing Skills In English II	2	2	3	6
PHY 102	General Physics II	3	2	4	6
MTH 102	Calculus II	3	2	4	7
MTH 104	Probability and Statistics for Engineers	3	0	3	5
XXX xxx	Non Technical Elective	0	2	0	0
	Total	14	8	17	30

Third Semester					
CODE	COURSE NAME	T	P	C	ECTS
EEE 200	Industrial Training I	0	0	0	2
EEE 201	Circuit Theory I	3	2	4	6
EEE 203	Electromagnetic Field Theory	3	0	3	4
CEN 283	Digital Design	3	2	4	5
MTH 201	Differential Equations	3	0	3	5
EEE 205	Semiconductor Devices and Modeling	3	0	3	5
XXX xxx	Non Technical Elective	3	0	3	3
	Total	18	4	20	30

Fourth Semester					
CODE	COURSE NAME	T	P	C	ECTS
EEE 202	Circuit Theory II	3	2	4	6
EEE 204	Electromagnetic Wave Theory	3	0	3	4
CEN 318	Microprocessors And Microcomputing	3	2	4	7
MTH 204	Numerical Analysis	3	0	3	4
EEE 206	Electronics I	3	2	4	6
XXX xxx	Non Technical Elective	3	0	3	3
	Total	18	6	21	30

Fifth Semester					
CODE	COURSE NAME	T	P	C	ECTS
EEE 390	Industrial Training II	0	0	0	2
EEE 301	Signals and Systems	3	2	4	5
EEE 311	Electronics II	3	2	4	5
XXX 3xx	Technical Elective I	3	0	3	5
XXX 3xx	Technical Elective II	3	0	3	5
XXX 3xx	Technical Elective III	3	0	3	5
XXX xxx	Non Technical Elective	3	0	3	3
	Total	18	4	20	30

Sixth Semester					
CODE	COURSE NAME	T	P	C	ECTS
EEE 382	Linear Control Systems	3	0	3	5
XXX 3xx	Technical Elective IV	3	0	3	5
XXX 3xx	Technical Elective V	3	0	3	5

XXX 3xx	Technical Elective VI	3	0	3	5
XXX 392	Senior Design Project	2	4	4	7
XXX xxx	Non Technical Elective	3	0	3	3
	Total	17	4	19	30

Technical Elective Courses					
CODE	COURSE NAME	T	P	C	ECTS
EEE 312	Biomedical Signals and Instrumentation	3	0	3	5
EEE 313	Fundamentals of Biomedical Engineering	3	0	3	5
EEE 314	Electronic Measurement and Instrumentation	3	0	3	5
EEE 315	Introduction to Medical Imaging	3	0	3	5
EEE 316	Foundations of Magnetic Resonance Imaging	3	0	3	5
EEE 321	Microwave Engineering	3	0	3	5
EEE 322	Antenna Engineering	3	0	3	5
EEE 324	Microwave Electronics	3	0	3	5
EEE 331	Telecommunications I	3	0	3	5
EEE 332	Telecommunications II	3	0	3	5
EEE 333	Digital Communication	3	0	3	5
EEE 334	Digital Signal Processing	3	0	3	5
EEE 336	Communication Electronics	3	0	3	5
EEE 342	Mobile and Wireless Communication	3	0	3	5
EEE 346	Introduction to VLSI design	3	0	3	5
EEE 348	Introduction to Image Processing	3	0	3	5
EEE 349	Introduction to Optical Fiber Communications	3	0	3	5
EEE 360	Illumination	3	0	3	5
EEE 361	Electrical Machinery I	3	0	3	5
EEE 362	Electrical Machinery II	3	0	3	5
EEE 364	Power System Analysis	3	0	3	5
EEE 365	Utilization of Electrical Energy	3	0	3	5
EEE 366	Electrical Power Transmission	3	0	3	5
EEE 367	Power System Protection	3	0	3	5
EEE 368	High Voltage Techniques	3	0	3	5
EEE 369	Distribution Systems	3	0	3	5
EEE 370	Industrial Electronics	3	0	3	5
EEE 371	Static Power Conversion	3	0	3	5
EEE 372	Power Electronics	3	0	3	5
EEE 373	Low Voltage Power Systems	3	0	3	5
EEE 380	Introduction to Robot Control	3	0	3	5
EEE 381	Process Control	3	0	3	5
EEE 382	Process Instrumentation and Control	3	0	3	5
EEE 383	Discrete Time Control System	3	0	3	5
EEE 391	HDL Based Logic Design	3	0	3	5
EEE 392	Embedded Systems	3	0	3	5

Non-Technical Elective Courses					
CODE	COURSE NAME	T	P	C	ECTS
BOS 101	Bosnian Language I*	0	2	0	0
TDE 191	Turkish Language I**	0	2	0	0
BOS 102	Bosnian Language II*	0	2	0	0
TDE 192	Turkish Language II**	0	2	0	0
ECO 101	Introduction To Economics I	2	2	3	3
BUS 103	Introduction To Business	3	0	3	3

BUS105	Business English	2	2	3	3
ECO 102	Introduction To Economics II	2	2	3	3
BUS 108	Introduction To Law	3	0	3	3
BUS 112	Fundamentals of Management	3	0	3	3
BUS 131	Behavioral Sciences	3	0	3	3
ECO 205	Microeconomics	2	2	3	3
ECO 206	Macroeconomics	2	2	3	3
BUS 211	Organization Theory I	3	0	3	
BUS 212	Organization Theory II	3	0	3	3
BUS 221	Marketing I	3	0	3	3
BUS 222	Marketing II	3	0	3	3
BUS321	Production Management	2	1	3	3
BUS324	Operations Research	3	1	4	
BUS451	International Marketing	*2*	1	*3*	3

* Mandatory for Turkish students.
** Mandatory for non-Turkish students.

FIRST SEMESTER

MTH 103 LINEAR ALGEBRA

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	4

Course Description:

Introduction to matrices. Fields and vector spaces, linear transformations, change of basis. Linear equations, existence and classification of solutions, Gaussian elimination and LU decomposition. Characteristic equation of a matrix: eigenvalues, eigenvectors and the Jordan form. Numerical techniques for computing eigenvalues and eigenvectors. Inner product spaces, quadratic form.

Course Objective:

Linear Algebra is a Math of the systems of linear equations and their solutions. There are a variety of applications of Linear Algebra. Sufficient knowledge in this field can assist students in learning other (more applicable) courses as Linear Programming Problems, Operations Research, Problems of Optimization ,etc. The main objectives of the course are • To extend the students knowledge on the Systems of Linear Equations • To realize the main areas of applicability of LA

Course Content:

- Systems of Linear Equations
- Types of matrices. Inverse Matrix.
- Solving Linear Systems. Gauss elimination method. Echelon form of a Matrix
- Determinants. Cramer’s Rule Determinant of 2x2 matrix, 3x3 matrix,..induction
- Solving Linear Systems. Analysis
- Vector Spaces Definition
- Linear independence
- Linear Transformations Definition
- Review Midterm
- Representation of LT by Matrix
- Eigenvalue, Eigenvector , Characteristic value, Charcteristic vector
- Inner Product Spaces Inner Product
- Inner Product Spaces Orthonormal basis, Orthogonalization process
- Quadratic Form Bilinear Forms, Sesqui-linear forms

References:

- Richard Hill: Elementary Linear Algebra Kenneth Hofman,
- Ray Kunze: Linear Algebra
- David C. Lay: Linear Algebra and its Applications

CEN 111 INTRODUCTION TO ALGORITHMS & PROGRAMMING

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	2	4	7

Course Description:

Introduction to Algorithms and Programming: The objective of this course is to equip the students with the basic understanding of algorithms and programming concepts. Flowcharts are also covered in the course

Course Objective:

The objectives of this course are to develop a basic understanding of programming concepts and using these programming concepts in C language. Structured programming concept is introduced. Programming constructs such as sequential structures, selection structures, and repetition structures are explained. As for introduction to programming with C languages, variables, if-then-else, loop structures: for/while/do-while, break/continue/switch statements, flowcharting solutions, arrays are covered.

Course Content:

Basic computer literacy, fundamentals of computer preprogramming, algorithm development and problem solving using flowcharts and pseudo codes, data types, constants, variables, basic input/output, sequences, selection and repetition structures, functions and arrays. Searching and sorting, abstract data types, structures, pointers, strings, input/output, file processing.

References:

Deitel, D., 2005: C How to Program. Prentice Hall.
Kleinberg J., Tardos E.,2005,: Algorithm Design. Addison Wesley

ELT 101 DEVELOPMENT OF READING AND WRITING SKILLS IN ENGLISH I

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
4	0	4	6

Course Description:
Development of Reading and Writing Skills in English I: The course reinforces academic reading skills (finding the main idea, skimming, scanning, inferring information, guessing vocabulary from context, etc.) through reading selections on a variety of topics. It also aims at developing critical thinking, which enables students to respond to ideas in a well-organized written format. Other reading related writing skills such as paraphrasing and summarizing are also dealt with.

Course Objective:

A survey of language design issues and their implications for translation and run-time support. Examination of modern programming languages and features: abstract data and control structures, procedures, parameter passing mechanisms, block structuring and scope rules, input/output, and storage management. Models of run time behavior.
Comparison of imperative and declarative programming languages.

Course Content:
a. An ability to apply knowledge of computing and mathematics appropriate to the discipline.
b. An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution.
c. An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs.
d. An ability to function effectively on teams to accomplish a common goal.
e. An understanding of professional, ethical, legal, security and social issues and responsibilities.
f. An ability to communicate effectively with a range of audiences.
g. An ability to analyze the local and global impact of computing on individuals, organizations, and society.
h. Recognition of the need for and an ability to engage in continuing professional development.
i. An ability to use current techniques, skills, and tools necessary for computing practice.
j. An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.
k. An ability to apply design and development principles in the construction of software systems of varying complexity.

References:

- Robert Cohen, Judy Miller :NorthStar Reading and Writing Advanced - Language Arts & Disciplines - Pearson Education, Limited 2003
- Sharon Scull : Critical Reading and Writing for Advanced ESL Students Prentice-Hall (1987)
- Dennis Baumwoll, Robert L. Saitz :Advanced Reading and Writing: Exercises in English as a Second Language : Modern Societies, Contrasts and Transitions 1978

PHY 101 GENERAL PHYSICS I

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	2	4	6

Course Description:

General Physics I: Vectors, kinematics, Newton's laws of motion, work and energy, conservation of energy, linear momentum and its conservation, rotation of rigid bodies about a fixed axis, angular momentum and its conservation.

Course Objective:

This is first part of the two parts introductory physics courses which has been offered to the freshman students at International Burch University. This introductory physics course has two main objectives: first of them to provide the student with a clear and logical presentation of the basic concepts and principles of physics. The second is to strengthen an understanding of the concepts and principles through a broad range of interesting applications to the real world. To meet these objectives, we have placed emphasis on sound physical arguments and problem-solving methodology. We have attempted to solve problems, which have practical application to show students the role of physics in the other disciplines like engineering, mathematics, chemistry and biology.

Course Content:

- Physics and Measurement,
- Motion in One Dimensions,
- Vectors
- Motion in Two Dimensions,
- The Laws of Motion,
- Circular Motion and Other Application of Newton`s Law,
- Work and Kinetic Energy ,
- Potential Energy and Conservation of Energy,
- Linear Momentum and Collisions,
- Rotation of a Rigid Object About a Fixed Axis,
- Laboratory includes some basic Physics experiments.

References:

- Raymond A. S.2007: Physics for Scientists and Engineers: Thomson - Brooks/Cole

MTH 101 CALCULUS I

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	2	4	7

Course Description:

Calculus I: Functions, Limits, continuity and derivatives. Applications. Extreme values, the Mean Value Theorem and its applications. Graphing. The definite integral. Area and volume as integrals. The indefinite integral. Transcendental functions and their derivatives. L'Hopital's rule. Techniques of integration. Improper integrals. Applications. Parametric curves. Polar coordinates.

Course Objective:

Expand understanding of mathematical topics that may have been previously studied. Introduce and explore topics that possibly have not been part of the student's mathematical experience. Develop an appreciation for the development of mathematical thought and the contributions that mathematics has made to our world. To learn the application of mathematics in real life problems and analyzing the results.

Course Content:

- Functions: review of Trigonometric,
- Exponential & Logarithmic functions.
- Limits and continuity.
- Derivatives: rules of differentiation, related rates.
- Applications of derivatives: extreme values, the Mean Value theorem and its applications, graphing.
- Integration: the indefinite/definite integrals, integration rules, fundamental theorem of calculus.
- Applications of integrals: Areas, volume of revolution, arc lengths.(Students from the Department of Mathematics cannot take this course for credit).

References:

- Edward, P.2002: Calculus. International Edition. Prentice Hall
- Jonhston E.H.,Mathews J.C., Raymond A. S.: 2007. Calculus. Addison Wesley
- Anton, H., I., Bivens S. D.: 2002: Calculus Early Transcendentals. John Wiley

BOS 101 BOSNIAN LANGUAGE I

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
0	2	0	0

Course Description:

This course is taught through the Bosnian Language. The course contains basic grammatical rules of the language. Everyday practical use of the language. This course is for Turkish students.

Evaluation:

The course is evaluated by one mid term and one final exam. Examinations may be either by multiple choice tests or written in essay form. 40% of the mid term exam point and 60% of the final exam point are added and the result becomes the success point. Homework assignments, presentations or project studies may be evaluated with 10% contribution within mid term exam and/or final exam. The student's overall success is determined through dependent evaluation system.

References:

- Ronelle Alexander, Ellen Elias-Bursac Bosnian, Croatian, Serbian, a Textbook: With Exercises and Basic Grammar, University of Wisconsin Press, 2006

TDE 191 TURKISH LANGUAGE I

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
0	2	0	0

Course Description:

This course is taught through the Turkish Language. The course contains basic grammatical rules of the language. Everyday practical use of the language. This course is for non-Turkish students.

Evaluation:

The course is evaluated by one mid term and one final exam. Examinations may be either by multiple choice tests or written in essay form. 40% of the mid term exam point and 60% of the final exam point are added and the result becomes the success point. Homework assignments, presentations or project studies may be evaluated with 10% contribution within mid term exam and/or final exam. The student's overall success is determined through dependent evaluation system.

References:

- Geoffrey Lewis: Turkish Grammar, Oxford University Press, 2001
- B. Orhan Dogan and Anna Wilman: Starting Turkish, Milet Publishing, 2007

SECOND SEMESTER

EEE 102 INTRODUCTION TO ELECTRICAL ENGINEERING

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	6

Course Description:

Basic circuit theory, analysis of DC circuits; steady-state analysis;
transformers; DC machines and induction motors; diode circuits, operational amplifiers;
numbering systems, logic gates and combinational circuits.

Course Objective:

To introduce students to the basic fundamentals of electrical engineering. Students will gain knowledge and understanding of basic DC and AC circuit theory, electronic devices and components, and digital and analog electronics. In addition, students will gain experience concerning the electrical engineering sections of the fundamentals of engineering exam.

Course Content:

- Basic Circuit Theory
- The analysis of DC Circuits
- The dynamics of Circuits
- The analysis of AC Circuits
- Power in AC Circuits
- Electric Power Systems
- Semiconductor Devices and Circuits
- Digital Electronics
- Analog Electronics
- Communication Systems
- Induction Motors

References:

- Foundations of Electrical Engineering, by J.R. Cogdell, 2nd Edition, Prentice Hall, 1999. ISBN: 0-13-092701-5.

ELT 102 DEVELOPMENT OF READING AND WRITING SKILLS IN ENGLISH II

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
4	0	4	6

Course Description:
Development of Reading and Writing Skills in English II: The course reinforces academic writing skills. In this course students write different types of essays based on the ideas they are exposed to in the reading selections. The emphasis is on the writing process in which students go through many stages from brainstorming and outlining to producing a complete documented piece of writing.

Course Objective:
This course will provide the student with advanced reading and writing skills necessary to succeed in subsequent English, liberal arts, and technical/occupational courses. There are two components to this class: students will read authentic pieces of writing, written for native speakers of English, and will focus on vocabulary development and comprehension. Writing assignments based on the readings will also be done.

Course Content:

Demonstrate comprehension of the information presented in the course through written tests.

- Read and comprehend a variety of reading materials.
- Have developed their vocabulary at both the receptive and productive levels.
- Use paraphrases as an aid to comprehension and to see how they are used in everyday
- reading material.
- Read for specific purposes.
- Engage in pre-writing activities.
- Write clear, effective sentences and paragraphs.
- Utilize critical thinking skills.
- Summarize and paraphrase specific reading selections.

References:

- Robert Cohen, Judy Miller :NorthStar Reading and Writing Advanced -Language Arts & Disciplines - Pearson Education, Limited 2003
- Sharon Scull : Critical Reading and Writing for Advanced ESL Students Prentice-Hall (1987)
- Dennis Baumwoll, Robert L. Saitz :Advanced Reading and Writing: Exercises in English as a Second Language : Modern Societies, Contrasts and Transitions 1978

- PHY 102 GENERAL PHYSICS II

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	2	4	6

Course Description:

General Physics II: Equilibrium of rigid bodies, oscillations, gravitation, fluid statics and dynamics, waves in elastic media, introduction to thermodynamics and kinetic theory, sound.

Course Objective:

This is second part of the two parts introductory physics courses which has been offered to the freshman students at International Burch University. This introductory physics course has two main objectives: first of them to provide the student with a clear and logical presentation of the basic concepts and principles of physics. The second is to strengthen an understanding of the concepts and principles through a broad range of interesting applications to the real world. To meet these objectives, we have placed emphasis on sound physical arguments and problem-solving methodology. We have attempted to solve problems, which have practical application to show students the role of physics in the other disciplines like engineering, chemistry, biology.

Course Content:

- Electric Fields,
- Gauss`s Law
- Electric Potential,
- Capacitance and Dielectrics,
- Current and Resistance,
- Direct Current Circuits,
- Magnetic Fields,
- Sources of Magnetic Field,
- Faraday's Law,
- Laboratory includes some basic Physics experiments.

References:

- Serway, R. A., Jewett R. J. W. 2004: Physics for Scientists and Engineers. Sixth edition. Thomson. Lab. Book: Physics – II (Electricity & Magnetism) Fatih University Publications…
- Giancoli, D. C.1998: Physics, Principles with applications, 5th edition. Prentice Hall, Upper Saddle River, New Jersey.
- David, H., Robert R. Jearl W.1997: Fundamentals of Physics. John Wiley & Sons. Inc. New York.

MTH 102 CALCULUS II

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	2	4	7

Course Description:

Calculus II: Infinite series, power series, Taylor series. Vectors, lines and planes in space. Functions of several variables: Limit, continuity, partial derivatives, the chain rule, directional derivatives, tangent plane approximation and differentials, extreme values, Lagrange multipliers. Double and triple integrals with applications. The line integral.

Course Objective:
In recent years calculus has become important in many fields, including business, life sciences, etc. Economists use calculus to forecast global trends. Biologists use it to forecast population size and to describe the way predators like foxes interact with their prey. Medical researchers use calculus to design ultrasound and x-ray equipment for scanning the internal organs of the body. The list is practically endless, for almost every professional field today uses calculus in some way. Sufficient knowledge on mathematics can assist students in being better decision-makers. This course is designed for the first year students with the major mathematics and engineering

Course Content:

Transcendental functions: integration and differentiation. Techniques of integration: Integration by substitution, by parts, partial fractions and by trigonometric substitution. Improper integrals. Calculus of sequences and series: Infinite series, tests of convergence, power series, Taylor series and Maclaurin series and calculations with Taylor series. Functions of several variables: differentiation of functions of several variables, partial derivatives, the Chain rule, directional derivatives, gradient vectors and tangent planes. Prerequisite: MATH 113.(Students from the Department of Mathematics cannot take this course for credit).

References:

- Thomas' Calculus, by R.L. Finney, M.D. Weir and F.R Giordano, published by Addison Wesley, 11th edition, 2006.
- Edward & Penney "Calculus", International Edition, Prentice Hall, New Jersey, 2002
- E.H. Jonhston & J.C. Mathews "Calculus", Addison Wesley, New York, 2002.
- H. Anton, I. Bivens and S. Davis, "Calculus Early Transcendentals" John Wiley, 7th Edition, 2002.

MTH 104 PROBABILITY AND STATISTICS FOR ENGINEERS

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:
Probability and Statistics for Engineers: Descriptive statistics. Sets, events, and probability. Random variables, discrete and continuous distributions. Mathematical expectation and correlation analysis. Discrete probability and popular distributions, Poisson process. Continuous probability distributions. Introduction to reliability theory and failure. Functions of random variables. Introduction to estimation theory. Simple and multiple regression and correlation, least squares. Statistics of extreme events. Testing of hypothesis. Engineering application

Course Objective:

Basic concepts and rules of probability; Random variables, expectation and variance, covariance, distribution functions, bivariate, marginal and conditional distributions. Popular distributions. The distributions of sample statistics, the law of large numbers, and the central limit theorem.

Course Content:

UNIT-I: Probability: Sample space and events – Probability – The axioms of probability - Some elementary theorems - Conditional probability – Bayer's theorem.
UNIT-II: Random variables – Discrete and continuous – Distribution – Distribution function.
UNIT-III: Distribution - Binomial, Poisson and normal distribution – related properties.
UNIT-IV: Sampling distribution: Populations and samples - Sampling distributions of mean (known and unknown) proportions, sums and differences.
UNIT-V: Estimation: Point estimation – interval estimation - Bayesian estimation.
UNIT-VI: Test of Hypothesis – Means and proportions – Hypothesis concerning one and two means – Type I and Type II errors. One tail, two-tail tests.
UNIT-VII: Tests of significance – Student's t-test, F-test, test. Estimation of proportions.
UNIT-VIII: Curve fitting: The method of least squares – Inferences based on the least squares estimations - Curvilinear regression – multiple regressions – correlation for univariate and bivariate distributions.

References:

- Probability, Statistics and Random Processes Dr.K.Murugesan & P.Gurusamy by Anuradha Agencies, Deepti Publications.
- Advanced Engineering Mathematics (Eighth edition), Erwin Kreyszig, John Wiley and Sons (ASIA) Pvt. Ltd., 2001.
- Probability and Statistics for Engineers: G.S.S.Bhishma Rao,sitech., Second edition 2005.

BOS 102 BOSNIAN LANGUAGE II

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
0	2	0	0

Course Description:

This course is taught through the Bosnian Language. The course contains basic grammatical rules of the language. Everyday practical use of the language. This course is for Turkish students.

Evaluation:

The course is evaluated by one mid term and one final exam. Examinations may be either by multiple choice tests or written in essay form. 40% of the mid term exam point and 60% of the final exam point are added and the result becomes the success point. Homework assignments, presentations or project studies may be evaluated with 10% contribution within mid term exam and/or final exam. The student's overall success is determined through dependent evaluation system.

References:

- Ronelle Alexander, Ellen Elias-Bursac Bosnian, Croatian, Serbian, a Textbook: With Exercises and Basic Grammar, University of Wisconsin Press, 2006

TDE 192 TURKISH LANGUAGE II

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
0	2	0	0

Course Description:

This course is taught through the Turkish Language. The course contains basic grammatical rules of the language. Everyday practical use of the language. This course is for non-Turkish students.

Evaluation:

The course is evaluated by one mid term and one final exam. Examinations may be either by multiple choice tests or written in essay form. 40% of the mid term exam point and 60% of the final exam point are added and the result becomes the success point. Homework assignments, presentations or project studies may be evaluated with 10% contribution within mid term exam and/or final exam. The student's overall success is determined through dependent evaluation system.

References:

- Geoffrey Lewis: Turkish Grammar, Oxford University Press, 2001
- B. Orhan Dogan and Anna Wilman: Starting Turkish, Milet Publishing, 2007

THIRD SEMESTER

EEE 200 INDUSTRIAL TRAINING I

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
0	0	0	2

Course Description:
Students must complete a 30 business-day (6 weeks) summer practice in an electric company or related department of any type of company. Students are expected to learn about a real business and work environment and get involved in many aspects of electrical engineering. Observations from industrial training must be documented and presented in the form of a clear and concise technical report.

Course Objective:
Students must complete a 30 business-day (6 weeks) summer practice in an electric company or related department of any type of company. Students are expected to learn about a real business and work environment and get involved in many aspects of electrical engineering. Observations from the industrial training must be documented and presented in the form of a clear and concise technical report.

Evaluation
Presentation contributes 20% to the overall performance.

EEE 201 CIRCUIT THEORY I

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	2	4	6

Course Description:

Circuit variables. Circuit elements and mathematical models. Simple resistive circuits. Multi-terminal and multi-port algebraic components. Techniques of circuit analysis. Reactive components. First and second order RLC circuits.

Course Objective:

To know the electrical circuit components and their properties. To be able to analyze the electrical circuits and learn the time domain analysis methods.

Course Content:

- Circuit Variables: System of Units, Charge, Voltage, Current, Power and Energy.
- Electrical Circuit Elements: Voltage and Current Sources, Electrical Resistance and Ohm's Law, capacitors and inductors
- Simple Resistive Circuits: Ohm's law, Resistors in Series and Parallel, Voltage and Current Divider, Delta-Star transformation, Equivalent Circuits.
- Techniques of Circuit Analysis: Kirchhoff's Laws, Nodal Analysis, loop analysis
- Techniques of Circuit Analysis: Dependant Sources analysis; (Nodal and loop analysis)
- Techniques of Circuit Analysis: Source Transformations, Thevenin's and Norton's Theorems, Maximum Power Transfer, Superposition.
- Operational Amplifier and Multi-terminal Algebraic Components
- Operational Amplifier and Multi-terminal Algebraic Components
- Capacitance: capacitance calculation, series and parallel connection of capacitance
- Inductance: Self and Mutual Inductances, calculation of inductances, series and parallel connection of inductances
- First-Order RC Circuits response: Natural and Step Responses
- First-Order RL Circuits response: Natural and Step Responses
- Second order RLC circuit response: Natural and Step Responses

References:

- Electric Circuit Analysis, David E. Johnson , John L. Hilburn, Johnny R. Johnson, and Peter D. Scott Wiley; 3 edition (January 1997) ISBN-10: 0471365718 ISBN-13: 978-0471365716
- Basic Engineering Circuit analysis, J. David Irwin,8th edition, Wiley & Sons, Limited, John, ISBN 0470115319

EEE 203 ELECTROMAGNETIC FIELD THEORY

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

Vector Analysis. Electrostatic and Magnetostatic forces and fields in vacuum and in material bodies. Energy and potential. Steady electric current and conductors. Dielectric properties of materials. Boundary conditions for electrostatic and magnetostatic fields. Poisson's and Laplace's Equations. Magnetic circuits and inductance.

Course Objective:

The aim of this course is to learn the fundamentals of static electromagnetic field theory.

Course Content:

- Introduction, vector algebra, scalar and vector fields, rectangular coordinate system
- Cylindrical and spherical coordinate systems, Coulomb's law and electric field intensity
- Electric field intensity due to point, line, sheet. and volume charge density
- Gauss' Law, charge distributions and electric flux density, Maxwell\\
- Divergence Theorem, potential and potential difference
- Potential of a system of charges, energy density of electrostatic field, dipole
- Current, current density, continuty of current, conductance, boundary conditions, method of images
- Dielectric materials, boundary conditions, capacitance and stored enerjy
- Poisson's and Laplace's equations, their applications for capacitance problems
- Separation of variables , numeric iteration, Biot-Savart law, Ampere's circuital law
- Stokes' Theorem, magnetic field intensity, magnetic flux density
- Forces on current carrying elements, magnetization, permeability, boundary conditions
- Magnetic circuits, energy in magnetostatic fields, inductance, mutual inductance

References:

- Engineering Electromagnetics, W. H. Hayt, Jr., J. A. Buck - Seventh Edition, 2007, McGraw-Hill, ISBN: 007-124449-2;
- Fundamentals of Engineering Electromagnetics, David K. Cheng - International Edition, Pearson, ISBN: 0-201-60071-4;
- Applied Electromagnetics: Early Transmission Line Approach, Stuart M. Wentworth, 2007, Wiley, ISBN: 0-470-04257-5;
- Electromagnetics for Engineers, Fawwaz T. Ulaby, 2005, Pearson, ISBN: 0-13-197064-X;

CEN 283 DIGITAL DESIGN

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	2	4	5

Course Description:

Digital Design : Boolean algebra, number systems, data representation, logic theorems, canonical forms, simplification techniques, logic gates, design of combinational circuits, timing and timing problems, sequential circuits, design of sequential circuits and the algorithmic state machine, programmable logic devices, register operations, basic computer organization and design.

Course Objective:

Understanding of digital logic at the gate and switch level including both combinational and sequential logic elements. Understanding of the clocking methodologies necessary to manage the flow of information and preservation of circuit state. An appreciation for the specification methods used in designing digital logic and the basics of the compilation process that transforms these specifications into logic networks.

Course Content:

- Introductory Concepts
- Number Systems, Operations and Code
- Logic Gates
- Boolean Algebra and Logic Simplification
- Sum of Products, Product of Sums, Karnaugh Maps
- Circuit Simplification using Karnaugh Maps and World Problems
- The other Simplification Techniques
- Combinational Logic and Functions of Combinational Logic (MUX, Decoder, Adder etc.)
- Midterm Exam
- Sequencial Logics Latches, Flip-Flops, and Timers.
- Design of Sequencial Logic Circuits
- Analaysis of Seqential Logic Circuits
- Counters and Registers
- Memory and Storage and Digital Computer Systems

References:

- M. Morris Mano and Charles R. Kim, Logic and Computer Design Fundamentals, Fourth Edition, Pearson, 2008.
- Floyd Thomas L.: Digital Fundamentals
- Mano M.: Digital Design

MTH 201 DIFFERENTIAL EQUATIONS

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

Differential Equations: First-order differential equations, second-order linear equations, Wronskian, change of parameters, homogeneous and non-homogeneous equations, series solutions, Laplace transform, systems of first-order linear equations, boundary value problems, Fourier series.

Course Objective:

Introduce basic topics and solution techniques of differential equations. Develop an appreciation for the development of mathematical thought and the contributions that mathematics has made to our world. Expand understanding of advanced mathematical topics and their applications with real life problems and analyzing the results.

Course Content:

- Introduction. Types of differential equations.
- First order Ordinary Differential Equations: Separable and homogeneous linear DE.
- First order ODEs: Exact DE
- First order ODEs: Solution by integrating factor.
- First order ODEs: Linear DE
- First order nonlinear ODEs: Special case of Bernoulli
- Second order linear ODE: Introduction. Some definitions. Linear independency. Boundary and initial value problems
- Exercises
- Midterm
- Explicit methods: Undetermined coefficient method. Variation of parameters method.Constant coefficient higher order DE: Method of Undetermined Coefficients, Variable coefficient higher order DE
- Cauchy-Euler Equation; application of Second order DE with constant Coefficient
- Series solution of DE; power series
- Bessels Equation
- system of DE

References:

- W. E. Boyce and R. C. DiPrima, “Elementary Differential Equations and Boundary Value Problems” John Wiley and Sons, Ltd., 1997
- Shepley L. Rose, “Differential Equations,” John Wiley & Son, Ltd.
- C. Ray Wylie, “Differential Calculus,” Mc Graw Hill, 1979.

EEE 205 SEMICONDUCTOR DEVICES AND MODELING

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

Semiconductor physics. p-n junction devices. Tunnel diode. Impact avalanche transit-time. Junction transistor. Metal-semiconductor devices. Metal-insulator-semiconductor devices. Surface field effect. Optoelectronic devices. Semiconductor lasers. Epitaxial process. Diffusion. Oxidation. Ion implantation. Metalization. Integrated circuit fabrication.

Course Objective:

The main object is to understand the application of the semiconducting materials; and to gain more information about techniques of their preparations and measurements and interpretation of the results.

Course Content:

- Physics and Properties of Semiconductors: crystal structure, energy bands, statistics, Fermi level, carrier concentration at thermal equilibrium, carrier transport phenomena, Hall effect, recombination, optical and thermal properties, basic properties for semiconductor operation.
- Device Processing Technology: oxidation, diffusion, ion-implantation, deposition, lithography, etching and interconnect
- p-n Junction: depletion region, diffusion, generation-recombination, current-voltage characteristics, junction breakdown, charge storage and transient behavior.
- Integrated-Circuit Technology: understanding at the level of Muller and Kamins of integrated-circuit fabrication processes
- Bipolar transistor: transistor action and dependence on device structure, charge control switching model, Ebers-Moll Model, current-voltage characteristics, non-ideal and limiting effects at extremes of bias.
- State-of-the-Art Bipolar Transistor Technology: poly-si emitters, narrow base, structural tradeoffs in optimizing performance.
- Metal-Semiconductor Contacts: equilibrium, idealized metal semiconductor junctions, nonrectifying (ohmic) contacts, Schottky diodes, tunneling.
- Metal-Oxide-Silicon System: MOS structure, capacitance, oxide and interface charge (charging of traps, tunneling through oxide).
- MOS Field-Effect Transistor: threshold voltage, derivation of current-voltage characteristics, dependence on device structure.
- State-of-the-Art MOS Technology: small-geometry effects, mobility degradation due to channel and oxide fields, velocity saturation, hot-electron effects, device wearout mechanisms.
- Quantum transport

References:

- Solid State Physics, N.W. Ashcroft and N. D. Mermin;
- Semiconductor Physics, K. Seeger;
- Electrons and Holes in Semiconductors, W. Shockley;
- An Introduction to Solid State Physics, C.Kittel;
- Solid State and Semiconductor Physics, J. P.McKelvey;
- Physics of Semiconductor Devices; S. Sze,
- Physical Properties of Semiconductors, C.M. Wolfe, N. Holonyak, G. Stillman.

FOURTH SEMESTER

EEE 202 CIRCUIT THEORY II

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	2	4	6

Course Description:

Sinosoidal steady-state analysis. Three-phase circuits. Laplace transform and its use in circuit analysis. Transfer function; gain and phase characteristics, filters. Fourier series and its applications to circuit analysis.

Course Objective:

Sinosoidal steady-state analysis. Three-phase circuits. Laplace transform and its use in circuit analysis. Transfer function; gain and phase characteristics, filters. Fourier series and its applications to circuit analysis

Course Content:

- Sinodoidal steady-state analysis
- Sinodoidal steady-state power calculations
- Three Phase Circuits
- Laplace Transform
- Frequency Selective Circuits
- Active Filters
- Fourier Series
- Two-port Circuits

References:

- Electric Circuits, 7-th Edition, by J. W. Nilsson, S. A. Riedel, Prentice-Hall, 2001.

EEE 204 ELECTROMAGNETIC WAVE THEORY

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	4

Course Description:

Wave equations. Modelling of aerial lines and cables. Modal analysis of transmission lines. Power line carrier communications. Mode coupling. Solution of transmission line transients using lattice, Fourier transform and time domain methods.

Course Objective:

Wave equations. Modelling of aerial lines and cables. Modal analysis of transmission lines. Power line carrier communications. Mode coupling. Solution of transmission line transients using lattice, Fourier transform and time domain methods.

Course Content:

- Review of Electromagnetic Wave Theory
- Review of Transmission line theory
- General Considerations of Transmission, Symmetrical Components
- Modelling of aerial lines and cables
- Modal analysis of transmission lines
- Power line carrier communications
- Mode coupling
- Solution of transmission line transients using lattice\
- Fourier transform and time

References:

- Haus, A, Hermann. Electromagnetic Fields and Energy. Englewood Cliffs, New Jersey 07632: Prentice Hall, Inc., 1989.

CEN 318 MICROPROCESSORS AND MICROCOMPUTING

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	2	4	7

Course Description:

Introduction to computer and microprocessor architecture, addressing modes. Arithmetic, logic and program control instructions. Programming microprocessor, 8086/8088 hardware specifications, interrupts, memory and basic I/O interface.

Course Objective:

This course provides an introduction to microprocessors. It uses C language to develop a foundation on the hardware, which executes a program. It is heavily based around the ARM 32-bit RISC microprocessor, a world-leading processor for power-sensitive applications, and covers many aspects of designing power-efficient systems around ARM cores. It focuses on Memory and I/O interface design and programming, study of microprocessor and its basic support components including CPU architecture, memory interfaces, bus concepts, serial I/O devices, and interrupt control devices. Laboratories directly related to microprocessor functions and its interfaces.

Course Content:

- Embedded C Language I
- Embedded C Language II
- General I/O
- General I/O
- UART I
- UART 2
- IIC Interface
- SPI Interface
- Timer
- PWM
- AD Converter
- DAC Converter
- Interrıpts I
- Interrupts II

References:

- John L. Hilburn Microcomputing/Microprocessors: Hardware, Software, and Applications , Prentice-Hall (1976)
- Elsevier Publishing Company (September 1984) R. R. Smardzewski Richard R. Smardzewski Microprocessor Programming and Applications for Scientists and (Data Handling in Science & Technology)

MTH 204 NUMERICAL ANALYSIS

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	4

Course Description:

Numerical Analysis: Solutions of nonlinear equations, Newton's method, fixed points and functional iterations, LU factorization, pivoting, norms, analysis of errors, orthogonal factorization and least square problems, polynomial interpolation, spline interpolation, numerical differentiation, Richardson extrapolation, numerical integration, Gaussian quadratures, error analysis.

Course Objective:

Binary Numbers. Error analysis. Solving systems of linear equations: Gaussian Elimination, modification Gaussian Elimination and L-U decomposition. Solutions of nonlinear equations and systems: Bisection, Newton's, secant and fixed-point iteration methods. Interpolation: Lagrange Approximation, Newton's Polynomials and Polynomial Approximation. Curve Fitting. Numerical Differentiation. Numerical Integration. Numerical Optimization. Numerical Solutions of the initial value and boundary value problems: Euler's, Heun's, Taylor's, Runge-Kutta Methods

Course Content:

- Binary Numbers
- Error analysis
- Solving equations x=g(x).Bracketing Method, Newton's, Secant and Fixed-Point Iteration Methods
- Aitken's Process and Steffensen's and Muller' Methods
- Iteration for Nonlinear Systems
- Newton's Method for Nonlinear Systems
- Solutions of systems of linear equations. Gaussian Elimination and L-U decomposition
- Solutions of systems of linear equations. Modification Gaussian Elimination Method
- Lagrange Polynomials
- Newton Polynomials and Polynomial Approximation
- Least-squares line. Curve fitting
- Numerical Differentiation and Numerical Integration
- Numerical Optimization
- Numerical Solutions of the initial value and boundary value problems: Euler's, Heun's, Taylor's Methods, Runge-Kutta Methods

References:

- John H.Mathews, Numerical Methods using Matlab, Prentice-Hall International, 2004
- John H.Mathews, Numerical Methods for Mathematics, Science, and Engineering, Prentice-Hall International, 1992.646 p.
- Erwin Kreyszig,Advanced Engineering Mathematics, John Wiley & Sons,New York,1993.
- Shoichiro Nakamura, Numerical Analysis and Graphic Visualization with Matlab, Prentice-Hall PTR, 1991, 519 p.

EEE 206 ELECTRONICS I

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	2	4	6

Course Description:

Conduction mechanism in metals and semi-conductors; doping in semi-conductors; p-n junction; diode characteristics and applications; power supplies; bipolar junction. Transistor operation; transistor characteristic; transistor biasing; small-signal modeling and analysis; JFET operation and biasing, MOSFET operation and biasing; FET small-signal modeling and analysis; thyristors and related devices.

Course Objective:

At the end of this course, students will be able to analyze and design diode clippers and clampers, analyze and design simple voltage supplies, describe the physical operation of diodes, BJT's, and FET's, analyze and design single stage BJT and FET amplifiers

Course Content:

- Conductivity in solids and semiconductors
- Semiconductor junctions
- Diodes and diode circuits
- Physics of the bipolar transistor
- Bipolar transistor biasing and small signal analysis
- Physics of the MOSFET
- MOSFET biasing and small signal analysis
- Behavior of amplifiers

References:

- Sedra & Smith, Microelectronic Circuits, 4th edition, Oxford Press
- R. Mauro, Engineering Electronics, Prentice Hall
- N.R. Malik, Electronic Circuits: Analysis, simulation, and design, Prentice Hall

FIFTH SEMESTER

EEE 390 INDUSTRIAL TRAINING II

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
0	0	0	2

Course Description:

Students must complete a 30 business-day (6 weeks) summer practice in an electronic company or related department of any type of company. Students are expected to learn about a real business and work environment and get involved in many aspects of electronics engineering. Observations from industrial training must be documented and presented in the form of a clear and concise technical report.

Course Objective:

Students must complete a 30 business-day (6 weeks) summer practice in an electronic company or related department of any type of company. Students are expected to learn about a real business and work environment and get involved in many aspects of electronics engineering. Observations from industrial training must be documented and presented in the form of a clear and concise technical report.

Evaluation:

Presentation contributes 20% to the overall performance

EEE 301 SIGNALS AND SYSTEMS

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	2	4	5

Course Description:

Continuous-time signals and systems. Continuous-time LTI systems. The Fourier transform and its applications. State variables for continuous-time systems. Discrete-time signals and systems. Discrete-time LTI systems. The z-transform and its applications. State variables for discrete-time systems.

Course Objective:

Continuous-time signals and systems. Continuous-time LTI systems. The Fourier transform and its applications. State variables for continuous-time systems. Discrete-time signals and systems. Discrete-time LTI systems. The z-transform and its applications. State variables for discrete-time systems

Course Content:

- Introduction to signals and systems
- LTI (Linear-Time-Invariant) systems
- Continuous-Time LTI systems and the convolution
- The Fourier transform and its properties
- The Fourier transform of some signals and the convolution
- The Fourier transform applications in Continuous-Time LTI systems
- State-Equations for the Continuous-Time LTI systems
- Miscallenous problems in Continuous-Time LTI systems
- Discrete-Time LTI systems
- Discrete-Time LTI systems and the convolution
- z-transform and its properties
- The z-transform and the convolution
- The z-transform applications in Discrete-Time LTI systems
- State-Equationsfor the Discrete-Time LTI systems

References:

- Signals, Systems, and Transforms, C. L. Phillips, J. M. Parr, 2007, 4th Edition, Prentice Hall. ISBN 0-13-198923-5

EEE 311 ELECTRONICS II

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	2	4	6

Course Description:

Multistage amplifiers; coupling techniques and frequency response; differential amplifiers; high-frequency modeling of transistors, feedback and broadbanding techniques. Analog Integrated Circuits; OpAmp; power amplifiers; filters and oscillators; regulated power supplies.

Course Objective:

At the end of this course, students will be able to analyze a given circuit such as differential amplifier or a multistage amplifier for input/output impedances or gain, analyze a given BJT or MOS circuit to find low and high cut-off frequencies, analyze a given BJT or MOS feedback circuit, design a BJT and MOS amplifier with the given gain or impedance spsecifications, design a BJT and MOS amplifier with the given cut-off frequency specifications

Course Content:

- Differential Amplifier
- Multitransistor/Multistage Amplifiers (cascade, cascode, etc)
- Frequency Response
- Feedback
- Output Stages and Power Amplifiers
- Analog Integrated circuits and OPAMP
- Power Supplies
- Filters and Oscillators

References:

- Microelectronic Circuits – Adel S. Sedra, Kenneth C. Smith
- Electronic Devices and Circuit Theory- R. Boylestadt and L. Nashelsky
- Electronic Circuits: Analysis, simulation, and design – N.R. Malik
- Engineering Electronics – R. Mauro
- Integrated Electronics – Millman, Halkias
- Microelectronic Circuits and Devices – Mark N. Horenstein

SIXTH SEMESTER

EEE 382 LINEAR CONTROL SYSTEMS

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

Mathematical models of systems. State variable models: Signal-flow graph state models. Characteristics and performance of feedback control systems. The stability of linear feedback systems: The Routh-Hurwitz criterion. The root locus method. Frequency response methods: The Bode diagram. Stability in the frequency domain: Nyquist criterion.

Course Objective:

To comprehend what is meant by analog and digital control systems. You will develop an understanding of feedback control theory, Learn analytical techniques to analyze/design control systems both analog and digital, Learn computer-aided techniques to analyze / design control systems.

Course Content:

- Introduction to Control Systems
- Mathematical Models of Systems
- State Variable Models
- Feedback Control System Characteristics
- The Performance of Feedback Control Systems
- The Stability of Linear Feedback Systems
- The Root Locus Method
- Frequency Response Methods

References:

- Modern Control Systems, Richard C. Dorf, Robert H. Bishop, 2008, 11th Edition, Prentice Hall.

EEE 392 SENIOR DESIGN PROJECT

Europan credit transfer system credit distrubition table			
T	P	C	ECTS
2	4	4	7

Course Description:

An independent study under the supervision of an advisor: Research on exploring and defining a potential study area suitable for a senior design project. Identification of a specific problem from the selected study area in electrical and electronics engineering. Results from this study are documented and presented in the form of a design project proposal Design and implementation of the project proposed. Presentation of the results in both oral and written forms.

Course Objective:

1- To do research trying to explore, define, and identify a specific electrical and electronics engineering problem.
2- To document the research results with a proposal of a design project.
3- To provide the student with the experience of conceiving, designing, and implementing a hardware project or hardware-related design project proposed .
4- To document the results.
5- To present the implemented project orally.

Course Content:

- Submission of Project Proposals by the Faculty and Announcement of the Proposed Projects
- Application for a Proposed Project, or Proposing Student's Own Project
- Announcement of the Projects Assignments to the Students
- Description of Project Requirements (in-class meeting) & Research
- Doing Research
- Submission of Project Progress Reports to the Advisor copy
- Implementation of the project.
- Submission of Project Progress Reports to the Advisor 1 copy
- Implementation of the project
- Submission of Final Project Reports to the Advisor 1 copy
- Submission of Final Project Reports to the Coordinator 3 copies

TECHNICAL ELECTIVE COURSES

EEE 312 BIOMEDICAL SIGNALS AND INSTRUMENTATION

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

Fundamentals of medical instrumentation. Bioelectric signals. Physiological transducers. Recording systems and biomedical recorders. Patient monitoring systems. Arrhythmia and ambulatory monitoring instruments. Fatal monitoring instruments. Blood flowmeters.

Course Objective:

At the end of the course, the student will own the theoretical knowledge on the use of biomedical instrumentation.

Course Content:

- The terminology and principles of Instrumentation Systems
- A review of medical and physiological signals
- Medical Electrodes
- Physiological Transducers
- Recording Systems and Biomedical Recorders
- Patient Monitoring Systems
- Plethysmography
- Heart sound measurement
- Blood flow measurement
- Blood pressure measurement
- Patient Safety

References:

- Introduction to Biomedical Equipment Technology, Joseph J. Carr, Marine Corps Systems Command, John M. Brown, Burr-Brown Corp. ISBN-10:0130104922,
- Lesilie Cromwell, Fred J.Weibell,Erich A.Pfeiffer,"Bio-Medical Instrumentation and Measurements" II edition, Pearson Education,2002/PHI
- R.S.Khandpur,"Handbook of Bio-Medical Instrumentation"Tata Mc Graw Hill Publishing Co.Ltd.2003.

EEE 313 FUNDAMENTALS OF BIOMEDICAL ENGINEERING

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

Introduction to cell physiology: the neuron, synapses and the neural models. Sources of bioelectrical potentials and theory of ECG, EEG, EMG. Electrodes for bioelectric and related instrumentation. Physiology and measurement of neural, circulatory, respiratory and metabolic systems. Phonocardiography. Patient care and monitoring. Telemetry.

Course Objective:

In general terms this course is designed to accomplish the following:

- Understand basic electric circuits and their usage for amplification and filtering of biological signals
- Learn the principles of interfacing with the living systems for collection of biological signals
- Learn the origins of biopotentials and their characteristics in time and frequency domain
- Apply modern engineering tools to collect, analyze and interpret biological signals

Course Content:

- History and Progress of Biomedical Engineering
- Introduction to cell physiology: the neuron and synapses
- Sources of bioelectrical potentials
- Physiology and measurement of ENG
- Physiology and measurement of EMG
- Physiology and measurement of ECG
- Physiology and measurement of EEG
- Physiology and measurement of Evoked Potential
- Physiology and measurement of ERG, EOG and PERG
- Physiology and measurement of Blood pressure

References:

- Milton Gussow, Schaum's Outline of Theory and Problems of Basic Electricity, McGraw-Hill, ISBN: 0-07-025240-8
- Medical Instrumentation Application and Design, John G. Webster, ISBN-10: 0471676004, ISBN-13: 978-0471676003

EEE 314 ELECTRONIC MEASUREMENT AND INSTRUMENTATION

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

Units and principles of measurement. Error of measurement. Probability of error. Electronic measurements and electronic measuring instruments: Instrument amplifiers, signal sources, oscilloscopes, digital frequency meters, digital voltmeters. High frequency and microwave measurement techniques.

Course Objective:

At the end of this course, students will be able to:

- Explain basic concepts and definitions in measurement.
- Explain the operation and design of electronic instruments for parameter measurement
- Explain the operation of oscilloscopes and the basic circuit blocks in the design of an oscilloscope.
- Explain the circuitry and design of various function generators.
- Explain the techniques used in signal analysis in time domain and frequency domain.
- Explain the operation and design of counters.
- Compare different ADC and DAC techniques and explain various circuits for conversion.
- Explain the transmission line effects pertaining to linear and non-linear loads in the context of bounce diagrams.

Course Content:

- Basic Concepts in Measurement
- Electronic Instruments for Parameter Measurement: AC/DC voltmeters, multimeters, digital voltmeter, component measurement, Q-meter, vector impedance meter
- Oscilloscopes: CRT's, deflection systems, probes
- Function Generators: sine-wave generators, frequency synthesis, pulse generators
- Signal Analysis: Wave analysis, harmonic distortion analyzer, spectrum analyzer
- Counters
- A/D and D/A Conversion
- Measurement of Transmission Line Effects, Bounce diagrams, linear and non-linear loads.

References:

- A.D. Helfrick and W.D. Cooper, Modern Electronic Instrumentation and Measurement Techniques, Prentice-Hall, 1990

- D. Buchla and W. McLachen, Applied Electronic Instrumentation and Measurement, Maxwell Macmillan Int. Publishing Group, 1992

EEE 315 INTRODUCTION TO MEDICAL IMAGING

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

X-Ray imaging: Radiography/mammography, fluoroscopy. CT: Operational modes, the CT gantry, image reconstruction, spiral CT, special imaging techniques, image quality, image artifacts, radiation safety, quality control. MRI: Concepts of magnetic resonance, principles of magnetic resonance imaging, pulse sequences, measurement parameters and image contrast, additional sequence modifications, artifacts, motion artifact, reduction techniques, MR angiography, advanced imaging applications, MR spectroscopy, instrumentation, contrast agents, clinical protocols. PET Scan. Ultrasound scan: The nature of diagnostic ultrasound, ultrasound interaction with tissue, ultrasound power and intensity, the ultrasound beam, the ultrasound imager, doppler ultrasound, ultrasound image artifacts, ultrasound quality control, biologic effects of ultrasound. IR scan.

Course Objective:

By the end of this course, the student should be able to: •List essential features of medical imaging systems; •Describe the three primary mechanisms by which electromagnetic ionizing radiation interacts with matter; •Discuss the health risks of radiation exposure and practical methods for reducing exposure •Diagram a typical X-ray source and explain its operation; •List and describe the components of a film-screen radiographic detection system and a digital X-ray detection system •Diagram a typical configuration for an X-ray CT system •Diagram a typical gamma camera and explain its operation; •Describe the process of image reconstruction in PET and SPECT

Course Content:

- Introduction
- Imaging concepts: contrast and spatial resolution
- Physics of Radiation
- Ionizing radiation: X-rays, gamma rays, particles
- X-ray Film-screen and digital radiography
- X-ray Mammography & Fluoroscopy
- Flow and Angiography
- Biological effects of radiation
- Computed Tomography
- Magnetic Resonance Imaging
- Nuclear Medicine Imaging
- Imaging applications in Therapy

References:

- Prince and J. M. Links, Medical Imaging Signals and Systems, Pearson Prentice-Hall, Upper Saddle River, NJ, 2006.

EEE 316 FOUNDATIONS OF MAGNETIC RESONANCE IMAGING

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

This course covers the basic principles of Functional Magnetic Resonance Imaging (fMRI), including: The physical principles of signal generation in MRI, the relation of neuronal activity with the blood-oxygen-level-dependent (BOLD) signal.
Main emphases of the course are techniques to conduct experiments investigating the functional activity of the nervous system, statistical analysis of the fMRI data

Course Objective:

- Basic understanding of physical and biological concepts of fMRI
- Basic knowledge of fMRI data collection and the operation of the scanner (through weekly hands-on sessions)
- Basic knowledge of fMRI experimental design

Course Content:

- Introduction to MRI scanners and fMRI
- Basic principles of MR signal generation & image formation
- Contrast mechanisms and pulse sequences (1):
- MR contrast mechanisms
- Proton-density imaging
- Gradient-echo and spin-echo pulse sequences
- Fast imaging sequences: EPI and spiral imaging
- Diffusion-weighted imaging
- From neuronal to hemodynamic activity:
- A primer on neuron
- ATP generation
- Vascular system of the brain
- Blood flow
- Introduction to the scanner console & image acquisition:
- BOLD fMRI (1)
- Spatial resolution
- Temporal resolution
- Linearity of HRF
- FMRI adaptation
- Image artifacts and ways to reduce them
- Signal and noise in fMRI; data preprocessing

References:

- Huettel, Song and McCarthy, "Functional Magnetic Resonance Imaging"

EEE 321 MICROWAVE ENGINEERING

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

Microwave transmission, transmission lines and waveguides. Microwave circuits. Scattering parameters. Microwave resonators. Microwave using ferrites. Generation and amplification of microwaves. Klystrons, magnetrons, traveling wave tubes. Semiconductors in microwaves

Course Objective:

To introduce the high frequency behavior of circuit and network elements as well as the analysis and the design of passive microwave devices.

Course Content:

- Review of basic electromagnetic theory.
- Introduction to guided waves (theory of general cylindrical waveguides).
- Review of transmission line theory.
- Smith Chart and transients in transmission lines.
- TE, TM and TEM waves in printed transmission lines and waveguides.
- Microwave network analysis.
- Impedance matching and tuning.
- Passive microwave circuit elements (Resonators, Power Dividers, Directional Couplers, Hybrids, etc.).

References:

- Robert S. Elliot, An Introduction to Guided Waves and Microwave Circuits,
- Prentice-Hall International, Inc. 1993,
- Peter A. Rizzi Microwave Engineering, Prentice-Hall International, Inc. 1988,
- R. E. Collin Foundations of Microwave Engineering, McGraw-Hill Book Company, 1966

EEE 322 ANTENNA ENGINEERING

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

Maxwell's equations, electric and magnetic field, radiation pattern, directivity, gain, matching techniques, wire antennas, array antennas, aperture antennas, Huygens's principles, microstrip antennas, reflector, antenna design, smart antenna systems.

Course Objective:

The main objective of the course is to introduce some of the fundamental concepts of the analysis and design of antennas and antenna systems.

Course Content:

- Introduction, Antenna Types and Radiation Mechanism
- Fundamental Parameters of Antennas
- Radiation Integrals, Auxiliary Potential Functions, Duality and Reciprocity Theorem
- Linear Wire Antennas, Infinitesimal Dipole and Finite Length Dipoles
- Loop Antennas
- Array Antennas: Linear, Planar and Circular Arrays
- Antenna Synthesis and Continuous Sources
- Matching Techniques
- Broadband Antennas
- Frequency Independent Antennas, Antenna Miniaturization and Fractal Antennas
- Aperture Antennas and Equivalence Principle
- Microstrip Antennas and Reflectors
- Smart Antennas
- Antenna Measurements

References:

- Antenna Theory: Analysis and Design-Third Edition, Constantine A. Balanis, Wiley, 2005, ISBN: 0-471-66782-X;
- Antennas: For All Applications-Third Edition, John D. Kraus and Ronald J. Marhefka, Mc Graw Hill, 2002, ISBN: 0-07-232103-2;
- Foundations of Antenna Theory and Techniques, Vincent F. Fusco, Pearson, 2005, ISBN: 0-130-26267-6

EEE 324 MICROWAVE ELECTRONICS

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

Techniques of analog circuit technology in the gigahertz high-frequency regime. Transmission lines and distributed circuit elements; S-parameter design of high-frequency active circuits; computer-aided analysis and design. Emphasis on design of planar high-frequency integrated circuits employing CMOS and SiGe technology. Circuit building blocks for broadband wired and wireless communication will be emphasized including oscillators, low-noise amplifiers, and power amplifiers.

Course Objective:

Techniques of analog circuit technology in the gigahertz high-frequency regime. Transmission lines and distributed circuit elements; S-parameter design of high-frequency active circuits; computer-aided analysis and design. Emphasis on design of planar high-frequency integrated circuits employing CMOS and SiGe technology. Circuit building blocks for broadband wired and wireless communication will be emphasized including oscillators, low-noise amplifiers, and power amplifiers.

Course Content:

- Introduction. Analog circuit technology at gigahertz frequencies.
- Transmission lines and distributed circuit elements.
- Microstrip transmission lines.
- S Parameters.
- Smith chart and impedance matching.
- Computer-aided analysis and design.
- Amplifiers
- Low-noise amplifiers
- Broadband amplifers
- Oscillators, VCOs
- Mixers
- Power Amplifers
- Project presentations

References:

- Microwave Engineering, David M. Pozar, 2nd ed., John Wiley & Sons,1998, ISBN 0-471-17096-8

EEE 331 TELECOMMUNICATIONS I

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

This is the first course in the series of two senior level courses on telecommunications aiming to introduce the basic principles behind the analysis and design of modern communication systems. The main goal of this course is to introduce the concepts of modulation and demodulation of information and the effect of noise on system performance. The topics that will be covered are spectral analysis of signals and systems, baseband representation of carrier modulated signals, random processes, continuous wave modulation (AM and FM) and their noise analysis, pulse modulation and baseband digital transmission.

Course Objective:

Introduce the concepts: decibel, noise, modulation; analysis of the operation of analog and digital systems communication systems

Course Content:

- Introduction to communication systems
- Fourier analysis of signals and systems
- Random processes
- Analog modulation
- Analog to Digital Conversion and Data Compression
- Baseband digital transmission

References:

- Leon W. Couch, Digital and Analog Communication Systems, 7th ed., Prentice Hall, 2007.
- John G. Proakis and Masoud Salehi, Communication Systems Engineering, 2nd edition, Prentice Hall, 2002.
- B. P. Lathi, Modern Digital and Analog Communication Systems, 3rd ed., Oxford University Press, 1998.
- Bruce Carlson, Paul B. Crilly, and Janet C. Rutledge, Communication Systems: An Introduction to Signals and Noise in Electrical Communication, 4th ed., McGraw-Hill, 2001.

EEE 332 TELECOMMUNICATIONS II

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

In this course, the basic concepts behind the design and analysis of digital communication systems will be introduced. Topics covered in class include sampling and quantization of analog information sources, digital pulse modulation techniques, signal space representation and analysis of digital signals, digital baseband modulation and demodulation, probability of error analysis, spectral shaping and intersymbol interference, digital bandpass transmission and error control coding.

Course Objective:

Introduction to probability theory. Random processes. Review of modulation techniques. AM and FM systems performance in presence of noise. Noise in digital communication systems. Optimal detection of signals and optimum receivers. Introduction to information theory. Error-correction codes.

Course Content:

- sampling and quantization of analog information sources,
- digital pulse modulation techniques,
- signal space representation and analysis of digital signals,
- digital baseband modulation and demodulation,
- probability of error analysis,
- spectral shaping and intersymbol interference,
- digital bandpass transmission and error control coding.

References:

- Simon Haykin, Communication Systems, John Wiley & Sons, 2001.

EEE 333 DIGITAL COMMUNICATION

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

Random Signals, Bandwidth of Digital Data, Character Coding, Pulse Code Modulation, Uniform and Nonuniform Quantization, Correlative Coding, Detection of Binary Signals in Gaussian Noise, Intersymbol Interference, Equalization, Coherent and Noncoherent Detection, Error Performance of Binary Systems, M-Ary Signaling and Performance, Waveform Coding, Cyclic and Block Codes, Types of Error Control, Convolutional Encoding and Decoding Algorithms.

Course Objective:

This course introduces the fundamentals of digital signaling, information theory and coding, digital transmission and reception. The goal is to equip the students with basic knowledge for design, analysis and comparison of digital communication systems and for the physical layer of data communication networks including wireless networks and the internet.

Course Content:

- Overview of digital communication systems:
- Source coding and source coding theorem
- Introduction to error control coding,
- Syndrome decoding, cyclic codes
- Channel capacity theorem
- Basic detection theory
- Detection of signals in additive white Gaussian noise, matched filter receivers
- Analog-to-digital conversion: sampling and Nyquist sampling theorem
- Quantization and signal-to quantization noise ratio
- Pulse code modulation, bandwidth of digital signals, differential PCM, delta modulation
- Time-division multiplexing, baseband digital signaling
- Partial response digital signaling, eye pattern, baseband M-ary systems
- Coherent and non-coherent reception of digital modulation signals.

References:

- Simon Haykin, Digital Communications , John Wiley & Sons, 1988

EEE 334 DIGITAL SIGNAL PROCESSING

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

Algorithms for Convolution and DFT Linear Prediction and Optimum Linear Filters, Least-Squares methods for Systems Modeling and Filter Design, Adaptive Filters, Recursive Least-Squares Algorithms for Array Signal Processing, QRD-Based Fast Adaptive Filter Algorithms, Power Spectrum Estimation, Signal Analysis with Higher-Order Spectra.

Course Objective:

The objective is to establish fundamental concepts of signal processing on multirate processing, parametric modeling, linear prediction theory, modern spectral estimation, and high-resolution techniques

Course Content:

- Signals and Systems
- Discrete-Time Fourier Transforms (DTFT's). Frequency Representation of Signals and Systems.
- Frequency and Phase Responses. Filter Structures.
- Sampling. Quantization. Analog-to-Digital Converters (ADC).
- FIR Filter Design: Windowing, Frequency Sampling, Parks-McClellan.
- IIR Filter Design: Impulse-Invariant, Bilinear, Prony, Shanks.
- DFT. FFT. Spectral Analysis and Estimation.
- Time-Frequency Analysis.
- Linear Prediction. AR Modeling. Levison-Durbin Algorithm.
- Adaptive Filtering. Least Mean Square (LMS) Adaptive Filters.
- LMS Convergence. Recursive Least Squares (RLS).
- Adaptive Filtering Applications.
- Multirate Fundamentals. Rate Conversion. Filter Banks.
- Quadrature Mirror Filters. Multirate Applications.

References:

- J.G. Proakis and D.G. Manolakis, Digital Signal Processing: Principles, Algorithms, and Applications, 4th ed., Prentice-Hall, 2007.
- A.V. Oppenheim, R.W. Schafer and J.R. Buck, Discrete-Time Signal Processing, Prentice- Hall, 2nd ed., 1999.

EEE 336 COMMUNICATION ELECTRONICS

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

Nonlinear controlled sources: piecewise linear, square-law, exponential and differential pair characteristics. Low level amplitude modulation and analog multiplication. Narrow band transformer as a coupler. Nonlinear loading of tuned circuits. Tuned large signal amplifiers and frequency multipliers. Phased locked loops. Sinusoidal oscillators. Frequency synthesizers, mixers, modulators, and demodulators. Basic transmitters and receivers.

Course Objective:

Nonlinearity. Nonlinear controlled sources. Amplitude modulation and analog multiplication. Narrow band transformer as a coupler. Nonlinear loading of tuned circuits. Tuned amplifiers. Frequency multipliers. Sinusoidal oscillators. Phase locked loops. Frequency synthesizers. Mixers. Modulators and demodulators. Basic transmitters and receivers.

Course Content:

- Nonlinearity.
- Nonlinear controlled sources.
- Amplitude modulation and analog multiplication.
- Narrow band transformer as a coupler.
- Nonlinear loading of tuned circuits
- Tuned amplifiers.
- Frequency multipliers. Sinusoidal oscillators.
- Sinusoidal oscillators, VCOs.
- Phase locked loops.
- Frequency synthesizers.
- Mixers.
- Modulators and demodulators
- Basic transmitters and receivers.

References:

- Modern Electronic Communication, Jeffrey S. Beasley, Gary M. Miller

EEE 342 MOBILE AND WIRELESS COMMNUNICATION

Europan credit transfer system credit distrubition table			
T	P	C	ECTS
3	0	3	5

Course Description:

Wireless transmission (physical layer), wireless media access (link layer), telecommunication systems (such as GSM/GPRS, DECT, TETRA, UMTS and IMT-2000), wireless LANs (IEEE 802.11, Bluetooth), mobile network layer (mobile IP, DHCP), mobile transport layer (TCP over wireless), mobile application support and wireless programming.
Recommended Course(s): CEN 362 or Chairman's consent.

Course Content:

- Introduction
- Wireless transmission (physical layer) (1/2)
- Wireless transmission (physical layer) (2/2)
- Wireless media access (link layer) (1/2)
- Wireless media access (link layer) (2/2)
- Wireless telecommunication systems: GSM/GPRS, EDGE, UMTS
- Wireless LANs: IEEE 802.11
- Wireless LANs: Bluetooth
- Mobile network layer (mobile IP, DHCP, mobile ad-hoc networks)
- Mobile transport layer (TCP over wireless)
- Mobile application support and introduction to wireless programming
- Wireless sensor networks

References:

- Stallings W., 2004, Wireless Communications and Networks, Second Edition, Prentice Hall
- Schiller J., 1999, Mobile Communications, Addison Wesley

EEE 346 INTRODUCTION TO VLSI DESIGN

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

Size and complexity of integrated circuits (IC), IC design process. Trends in very large scale integrated (VLSI) circuit design. IC production process. Semiconductor processes. Design rules and process parameters. Layout techniques and practical considerations. Device modeling, circuit simulation. Basic integrated circuit building blocks.

Course Objective:

To learn VLSI physcial design automation.

Course Content:

- Introduction
- Circuit Partitioning
- Floorplanning
- Placement
- Placement
- Layout generation

References:

- Vlsi Physical Design Automation: Theory and Practice Authors: Sadiq M. Sait, Habib Youssef

EEE 348 INTRODUCTION TO IMAGE PROCESSING

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

Digital images, sampling and quantization of images. Arithmetic operations, gray scale manipulations, distance measures, connectivity. Image transforms. Image enhancement. Image restoration. Image Segmentation. Image representation and description.

Course Objective:

To learn fundamentals of image processing.

Course Content:

- Introduction
- Image processing in MATLAB
- 2D filter theory
- Image compression
- Wavelets
- Edge detection, Morphology
- Tomography

References:

- Digital Image Processing, 3rd Edition Authors: Gonzalez & Woods Prentice Hall ISBN number: 9780131687288 Copyright: 2008

EEE 349 INTRODUCTION TO OPTICAL FIBER COMMUNICATIONS

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

An introduction to optical communication systems. Optical fiber waveguides. Transmission characteristics of optical fibers. Optical fibers, cables and connections. Optical fiber measurements. Optical sources: Lasers, LEDs. Optical detectors. Receiver noise considerations. Optical fiber communication systems.

Course Objective:

The objectives of this course are to provide the students with a solid understanding on: Optical Fibers and their fabrication, signal degradation in optical fibers, optical sources, power launching and coupling, photodetectors, photodetectors, digital and analog transmission systems, WDM concepts and components. Optical Amplifiers. Optical Networks.

Course Content:

- Overview of Optical Fiber Communications Systems. Optical Fibers
- Fabrication of optical fibers; Types of Optical Fibers
- Signal Degradation in Optical Fibers
- Optical Sources: LEDs
- Optical Sources: Laser Diodes
- Power Launching and Coupling
- Fiber Splicing; Optical Fiber Connectors
- Photodetectors
- Optical Receivers
- Digital Transmission Systems
- Analog Systems
- WDM Concepts and Components
- Optical Amplifiers
- Optical Networks

References:

Gerd Keiser, Optical Fiber Communications, McGraw-hill, New York, 3rd Ed.,2000.

EEE 360 ILLUMINATION

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

Light theories. Eye, sensitivity and vision types. Light reflection, absorption and transmission phenomenon. Definition of lighting terms. Lighting methods. Internal lighting systems and calculations. Lighting apparatus and armatures. Fotometric measurements. Pre-project preparation fundamentals. Interior electrical installations, low current and high current systems and drawings. Feeder, column and main-column line formation. Fundamentals of practical application project preparations. Low power-factor correction methods in internal installations. Voltage-drop calculation for lighting systems. Hardware Equipment for Computer Aided Design. Representation of CAD Packet Program (AutoCAD). Usage of Primary Drawing Commands. 2-Dimentional Drawing. Text Operations. Project Applications.

Course Objective:

Students will learn about interior lighting of various type buildings. Topics are: Light theories. Eye, sensitivity and vision types. Light reflection, absorption and transmission phenomenon. Definition of lighting terms. Lighting methods. Internal lighting systems and calculations. Lighting apparatus and armatures. Fotometric measurements. Pre-project preparation fundamentals. Interior electrical installations, low current and high current systems and drawings. Feeder, column and main-column line formation. Fundamentals of practical application project preparations. Low power-factor correction methods in internal installations. Voltage-drop calculation for lighting systems. Hardware Equipment for Computer Aided Design. Representation of CAD Packet Program (AutoCAD). Usage of Primary Drawing Commands. 2-Dimentional Drawing. Text Operations. Project Applications.

Course Content:

- Light theories. Eye, sensitivity and vision types
- reflection, absorbtion and transmission phenomenon
- Definition of lighting terms
- Lighting methods
- Internal lighting systems and calculations
- Lighting apparatus and armatures
- measurements
- Pre-project preparation fundamentals
- Interior electrical installations, low current and high current systems and drawings
- Feeder, column and main-column line formation.
- Fundamentals of practical application project preparations.
- Low power-factor correction methods in internal installations.
- Hardware Equipment for Computer Aided Design

References:

- 1.Gary Gordon, “Interior Lighting”, Wiley, Fourth Edition, January 10, 2003..
- 2.Mark Karlen, James R. Benya, “Lighting Design Basics”, Wiley, March 19, 2004.
- 3.Randall Whitehead, “Residential Lighting : A Practical Guide”, John Wiley & Sons, November 14

EEE 361 ELECTRICAL MACHINERY I

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

Electromagnetic circuits; properties of ferromagnetic materials. Single-phase and three-phase transformers. Per Unit System. Principles of electromechanical energy conversion: Linear and nonlinear systems; singly and multiply excited, translational and rotational systems. DC machines: Theory, generators, motors, speed control.

Course Objective:

The course objective is obtaining theoretical and practical insight about DC machines and transformers To be able to deal with basics of transformers; to be able to differentiate between DC machines and AC machines; To be able to deal completely with both DC motors and DC generators; to know how to control the speed of DC motors and the voltage of the DC generators

Course Content:

- Introductory Background: Complex numbers., Inductive impedance circuits and Phasor diagrams, Faraday's law, Lenz law, Magnetic force, Ampere's law
- Magnetic Circuits: Ampere's law and magnetic circuits, B-H curve, Magnetization curve
- Magnetic Circuits: Magnetic circuit with air gap, inductances, magnetic materials
- Transformers: single phase transformers, ideal transformers, practical transformers
- Transformers equivalent circuit, Open and short circuit tests, voltage regulation, efficiency, auto transformers
- Three phase transformers
- Per unit systems
- Fundamental of electromagnetic energy conversion
- Fundamentals of DC machines: Construction, Commutation, Armature reaction
- DC generators: Separately excited, Shunt, Compound, and series generators
- DC motor: Separately excited, Shunt, Compound, and series generators
- Dc motors: Starting and braking
- DC motor speed control.

References:

- Electric Machinary Fundamentals Fourth Edition Stephen J. Chapman ISBN:0072465239

EEE 362 ELECTRICAL MACHINERY II

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

Electromagnetic fields created by AC electric machine windings: pulsating and rotating magnetic fields, emf induced in a winding. Induction machines: equivalent circuit, steady-state analysis, speed control. Synchronous machines: equivalent circuit, steady-state analysis, stability. Single-phase induction machines. Special electrical machines.

Course Objective:

To learn theory of AC machinery fundamentals, machine parts and to obtain practical skills for operating AC machines.

Course Content:

- AC Machine Fundamentals, the rotating Magnetic field
- Magneto motive force and flux distribution on AC Machines
- Induced voltage in AC machines
- AC Machine power flows and losses
- Basic induction motor concepts
- The equivalent circuit of an induction motor
- Torque speed characteristic of induction motors, induction generators
- Synchronous generator concept
- Equivalent circuit of a synchronous generator
- The phasor diagram of synchronous generato
- Synchronous motors, equivalent circuit, steady state operation
- Starting synchronous motor, power factor correction with synchronous motor
- Special AC Machines

References:

- Electric Machinery Fundamentals: Stephen Chapman Electric Machinery: A.E. Fitzgerald, Charles Kingsley Jr., Stephen D. Umans

EEE 364 POWER SYSTEM ANALYSIS

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

Basic structure of electrical power systems. Electrical characteristics of transmission lines, transformers and generators. Representation of power systems. Per Unit System. Symmetrical three-phase faults. Symmetrical components. Unsymmetrical faults.

Course Objective:

Students will gain the knowledge of power systems analysis. Introduction, review of phasors and three phase power Transmission line parameter computation and analysis Models for transformers, generators, and loads Power flow analysis and control Generation Control, economic dispatch and restructuring Short circuit analysis, including symmetrical components Transient stability System protection

Course Content:

- Basic concepts
- Complex power and per-unit quantities
- Transformers
- The synchronous machine
- Symmetrical components and sequence networks
- Resistance and series impedance of transmission lines
- Capacitance of transmission lines
- Steady state analysis of transmission lines, Reactive Power compensation
- Maximum power, the admittance model
- The impedance model
- Short and medium-length transmission lines
- The long transmission line, transmission line transient analysis

References:

- Glover and Sarma, “Power System Analysis & Design”, Brooks/Cole publishing, 3rd ed., 2002

EEE 365 UTILIZATION OF ELECTRICAL ENERGY

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

Basic operating characteristics and classification of electrical drives. Solid state DC motor control. Solid state AC motor control. Dynamic behavior of electrical machines. Electric braking. Starting of electrical machines. Intermittent loads. Drive applications. Modern methods of reactive power compensation. Electrical energy saving.

Course Objective:

This course is designed to equip seniors knowledge about operation principles and design of modern, static AC and DC Motor Drives and to give them an ability to choose such systems for various industrial applications.

Course Content:

- Basic definitions for static dc and ac drives, Classifications, Four-quadrant operation and operating characteristics.
- Load characteristics, Definition of the speed control problem.
- Single-phase line commutated Drives, half-wave, full wave and Gaudet drive circuit
- Three-phase line commutated Drives,three-phase incomplete bridge, complete bridge, effects of free wheeling diode on the performance.
- DC-to-DC Drives. A dc motor supplied from a chopper, basic Jones chopper circuit, Motoring and regeneration.
- Field winding supply Methods, Speed control by field weakening
- The static variable-frequency AC drives, constant volts/Hz operation, the dc link converter, frequency control, alternative methods of voltage control, control circuitry.
- Induction motor speed control by the variation of stator voltage, basic circuits including back-to-back connected thyristors, phase-angle control and Integral-cycle control, Control circuitry.
- Wound-rotor induction-motor speed control by a static converter cascade
- Static control of external rotor-resistance for wound-rotor, induction-motor speed control.
- Protection: Protection against line voltage transients, overload, faults, high di/dt, high dv/dt, EMI and RFI. Basic protecters such as transient voltage suppressors, snubbers, semiconductor fuses, chokes, capacitors. Safety margins in semiconductor device selection.
- Practical aspects of electric motor drives: Speed sensing, current sensing, practical firing circuits. Basic Control circuits
- Dynamic analysis of electric motors, electric braking
- Selections of drives, intermittent loads, applications

References:

- Utilization of Electrical Energy by JB Gupta, Kataria Publications, Ludhiana
- Generation, Distribution and Utilization if Electrical Power by CL Wadhwa, Wiley Eastern Ltd., New Delhi
- A.Text Book. of Electrical Power by Dr. SL Uppal, Khanna Publications, Delhi

EEE 366 ELECTRICAL POWER TRANSMISSION

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description: This course explains the power system and discusses how to improve power transmission reliability in an effort to reduce the occurrence of power outages. The course reviews the power system fundamentals that apply to generation, transmission and distribution. It discusses the stability and reliability issues involved in an interconnected power system and the operation of the grid. The present regulatory environment is discussed and the measures to ensure stability are explained.

Course Objective: To provide a clear understanding of power system reliability through a step-by-step review of the power system elements and analysis, concepts of real and reactive power and their utilization in power transmission, line protection and its importance in maintaining system stability, and the latest developments to enhance the bulk power system reliability.

Course Content:

- Transmission Line Constants:
- Overhead Lines
- Performance of Transmission Lines
- Corona
- Substations
- Extra High Voltage Transmission

References:

- Modern Power System Analysis: Nagrath and Kothari, TMH
- A Course in Electrical Power Systems: Soni, Gupta, Bhatnagar
- HVDC Power Transmission System: K. R. Padiyar
- Power System Analysis: Bergen, Pearson, 2/e

EEE 367 POWER SYSTEM PROTECTION

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

Investigation of current and voltage waveforms during faults and other conditions. Distance and carrier-aided distance protection. New protection schemes applicable to high-speed protection. Digital relaying. Developments in integrated protection, control and measurement systems.

Course Objective:

To provide an in-depth view of the methods and devices used in electric power system protection; protection systems, relay types, protection of machines, transformers, buses and lines; instrument transformers; and modern trends in protection including digital techniques

Course Content:

- Primary and back up protection, current transformers for protection, potential transformer
- review of electromagnetic relays static relays.
- Over current relays time current characteristic, current setting time setting, directional relay, static over current relays
- Distance protection
- Compensation for correct distance measurement, reduction of measuring units switched schemes.
- Pilot relaying schemes. Wire pilot protection, circulating current scheme, balanced voltage scheme, transley scheme , carrier current protection, phase comparison carrier current protection, carrier aided distance protection.
- Digital relaying algorithms
- differential equation technique, discrete fourier transform technique, walsh-hadamard transform technique
- rationalized harr transform technique, removal of dc offset
- Introduction to Microprocessors: review of microprocessors and interfacing.
- single chip microcomputers programmable interval timer, A/D converter.
- Microprocessor based protective relays
- over current, directional, impedance, reactance relays
- Generalized mathematical expressions for distance relays, mho and offset mho relays, quadrilateral relay.

References:

- Power system protection & switchgear by Badri ram & vishwakarma, TMH publication New Delhi 1995.

EEE 368 HIGH VOLTAGE TECHNIQUES

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

Field analysis: experimental and numerical (finite difference, finite element and charge simulation) methods and applications. Electrical breakdown in gases: ionization processes. Townsend's breakdown criterion, Paschen's Law, bread-down in electronegative gases, time lags. Streamer-Kanal mechanism, breakdown in non-uniform field and corona. Electrical break-down of liquids: breakdown mechanism of pure and commercial liquids. Electrical breakdown of solids: Intrinsic, electromechanical, thermal and erosion mechanism. Insulating materials: dielectric gases; insulating oils and solid dielectrics.

Course Objective:

A review of Electric and magnetic fields; Generation of high voltages; Measurements of high voltages; Electrostatic fields and field stress control; Electrical breakdown in gasses; Breakdown in solid and liquid bielectrics; Non-destructive insulation test techniques; Overvoltages, testing procedures and insulation coordination; Design and testing of external insulation. High voltage circuit elements; High voltage transformers, circuit breakers, surge arresters. Grounding in high voltage transmission systems.

Course Content:

- Review of electric field theory
- Review of electromagnetic field theory
- Generation and measurement of high voltages: DC, AC and pulse voltages and measurement methods for measuring peak voltages.
- Electrostatic fields and field stress control: Field properties in various environments, produced field stresses and their control problems
- Electrical breakdown in gasses: Breakdown problems in the gasses used in various special locations
- Breakdown in solid and liquid dielectric
- Non-destructive insulation test techniques
- Overvoltages
- Testing procedures and insulation coordination
- Design and testing of external insulation
- High voltage devices
- High voltage transformers, measurement transformers.
- circuit breakers, surge arresters
- Grounding in high voltage transmission systems

References:

- M.S. Naidu and V. Kamaraju, High Voltage Engineering, second edition, NY: McGraw-Hill, 1996.

EEE 369 DISTRIBUTION SYSTEMS

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

Basic considerations. Load characteristics and forecasting methods. Distribution substations. Subtransmission, primary and secondary distribution. Choice of voltage levels. Operational characteristics of cables, aerial lines and transformers. System voltage regulation. Power factor correction. Fusegear, switchgear, current and voltage transformers. Overcurrent and thermal protection. Earthing methods. Economics of distribution systems.

Course Objective:

Basic considerations. Load characteristics and forecasting methods. Distribution substations. Subtransmission, primary and secondary distribution. Choice of voltage levels. Operational characteristics of cables, aerial lines and transformers. System voltage regulation. Power factor correction. Fusegear, switchgear, current and voltage transformers. Overcurrent and thermal protection. Earthing methods. Economics of distribution systems.

Course Content:

- Introduction. overview of a complete power system
- Voltage levels in power system, tie-bar and ring system. selection of conductor cross-section regarding current capacity, voltage drop and power loss.
- Calculation of voltage drop in tie-bar network
- Ring system. more complicated ring system. reduction method
- Determination of power rating of a distribution transformer
- Fuses
- coordination of protective devices (selectivity)
- application of distribution capacitors to distribution networks. series capacitors
- Ferroresonance. nature of loads (demand factor, load factor, utilization factor, diversity factor...)
- Grounding. equipment grounding. system grounding. special grounding

References:

- Electric Power Distribution System Engineering, Turan Gönen, McGraw-Hill Publishers 1986

EEE 370 INDUSTRIAL ELECTRONICS

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

Review of four layer devices and their applications. Gate control techniques in power switching elements and their protection. Introduction to solid-state energy conversion. AC/DC, AC/AC, DC/AC and DC/DC converters. Introduction to control of electrical drives. Industrial control systems: Relay circuits; ladder diagrams. Sequential control circuits. Case studies.

Course Objective:

At the end of this course, students will be able to:

- Describe the operation of power conversion circuits and Compare the advantages and disadvantages of different topologies
- Be able to select a power converter for a given drive system
- Explain how robots are used for industrial automation and for what purpose and compare the advantages and disadvantages of different actuation systems (electrical, hydraulic and pnemautic)
- Design a PLC sytem for sequential operation of an industrial process
- Demonstrate an awareness of current issues in industrial electronics equipment

Course Content:

- Review of four layer devices and their applications
- Gate control techniques in power switching elements and their
- Introduction to solid state energy conversion
- AC/DC, AC/AC, DC/AC and DC/DC converters
- Introduction to control of electrical drives
- Industrial control systems; Relay circuits; Ladder diagrams
- Sequential control circuits
- Programmable Logic Controllers

References:

- M. H. Rashid; Power Electronics, Power Electronics: Circuits, Devices, and Applications, Prentice Hall, 1988
- O. Kaynak, Güç Elektroniği: Elemanlar, Devreler ve Sistemler, Boğaziçi Universitesi, 1988

EEE 371 STATIC POWER CONVERSTION

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

Power switches and their characteristics. Power converter definitions, classification. VTA method. Midpoint and bridge rectifiers: non-ideal commutation, harmonics, input power factor, utility-factor, winding utilization and unbalances in rectifier transformers. Applications.

Course Objective:

This course is designed to give seniors in Electrical and Electronics Engineering an ability to use modern power semiconductor devices in power electronics applications and to integrate them into overall designs of static converters which perform interconversion of electrical energy. Operation principles,terminal characteristic and technical features of line-commutated ac-to-dc converters are also presented within the scope of this course.

Course Content:

- Introduction
- Classification and Historial evolution of power semiconductor devices, basic operating characteristics, and ranges, comparisons and major application areas
- SCRs. Power Bipolar Junction Transistors
- Power Bipolar Junction Transistors. Power MOSFETs
- Analysis and design of cooloing systems for power electronics
- The sources of power losses in power semiconductors and Basic forms of heat transfer
- Modelling For Operation at Steady-State, Modelling for Operation at Transient-State
- RL load supplied from a d.c. source via a single thyristor. RL load supplied from a single-phase ac source via back-to-back connected thyristor pair, Transient-free switching.
- Line commuted rectifier circuits:Assumptions, definitions and circuit nomenclature. Performance Parameters
- Single-phase circuits. Uncontrolled half-wave. Fully-controlled half-wave. Principles of Freewheeling Operation
- Bi-phase circuits.Fully-controlled half-wave. Single-phase Bridge circuits.Uncontrolled, half-controlled, fully-controlled
- converter operation; Operation in Reectification and Inversion modes by firing angle control.
- Four-quadrant operation by the use of reverse connected converters and firing angle control
- Overlap Phenomenon Voltage Regulation Power Factor Rectifier Harmonics VTA (Voltage Time Area) Method

References:

"Power Electronics: Circuits, Devices and Applications" Muhammed H. Rashid, 1993

EEE 372 POWER ELECTRONICS

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

Semiconductor power devices and switching circuits. Complementary components and systems. AC-to-DC converters. AC-to-AC converters. DC-to-DC converters. DC-to-AC converters. Switching power supplies.

Course Objective:

To learn theory of power electronics and to obtain practical skills.

Course Content:

- Introduction to power electronics.
- Fundamentals: Fourier series, RLC Circuits
- Diode, SCR, Mosfet, IGBT, Mosfet
- Half-Wave Rectifiers.
- Full-Wave Rectifiers.
- DC to DC Buck Converter
- DC to DC Boost Converter.
- DC to DC Buck- Boost Converter.
- PWM-Inverters.
- Resonant Pulse Inverters.
- Power Supplies.
- Passive filters.

References:

- Power Electronic by Ned Mohan Power Electronics (Circuits, Devices, and Applications), Muhammed H. Rashid, Prentice Hall 3'rd adition

EEE 373 LOW VOLTAGE POWER SYSTEMS

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

Power calculations in distribution systems. Power measurements. Secondary networks and load characteristics. Voltage drop and power loss calculation in networks. Voltage drop and power loss calculations for selection of conductor cross-sections. Low voltage power distribution in buildings. Selection of fuses, contactors and power switches. Grounding.

Course Objective:

The objectives of this course are to learn the operation of low voltage power systems. Topics are: Introduction to energy systems. Basic knowledge and electrical devices. Single phase and three phase power calculations. Power factor correction. Power system modeling. Distribution and transmission cables. Short circuit calculations. Fuses, conductors and circuit breakers in power systems. Measurement methods in low voltage systems. Earthing, concepts and methods. Introduction to touch and step voltages.

Course Content:

- Introduction to energy systems.
- Single phase and three phase power calculations
- Power factor correction
- Power system modeling
- Distribution and transmission cables
- Short circuit calculations
- load characteristics
- Fuses
- conductors and circuit breakers in power systems
- Measurement methods in low voltage systems
- Voltage drop and power loss calculations for selection of conductor cross-sections
- Introduction to touch and step voltages.

References:

- Analysis and Design of Low-Voltage Power Systems: An Engineer's Field Guide, Ismail Kaşıkçı, Wiley-VCH; 1 edition

EEE 380 INTRODUCTION TO ROBOT CONTROL

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

Introduction to robotics. Robot kinematics: Position analysis, The Denavit-Hartenberg representation. Differential motions and velocities: The manipulator Jacobian, derivation of the Jakobian, inverse Jakobian. Dynamic analysis and forces: A short review of Lagrangian mechanics, dynamic equations for MDOF robots, static force analysis of robots. Trajectory planning. Actuators. Sensors. Image processing and analysis with vision systems. Robot control: Independent joint control, multivariable control, force control, variable structure and adaptive control, fuzzy logic control

Course Objective:

Dynamics: Review of Lagrangian dynamics, actuator and sensor dynamics. Trajectory planning: Cartesian space, joint space, interpolation methods. Position control: Independent joint control, PID and feed forward control, computing torque and inverse dynamics, resolved motion control, control of orientation. Force Control: Stiffness and compliance, network models, hybrid and impedance control.

Course Content:

- Introductory Material and Review
- Kinematics of Position
- Differential Motions
- Robot Dynamics and Force Control
- Path and Trajectory Planning
- Actuators
- Sensors
- Vision Systems
- Fuzzy Logic

References:

- “Introduction to Robotics – Analysis, Systems, Applications”, Saeed B. Niku, 2001, Prentice Hall. ISBN: 0-13-061309-6.
- “Robot Dynamics and Control”, M. W. Spong, Seth Hutchinson and M. Vidyasagar, 2006, John Wiley and Sons. ISBN: 0-471-64990-2.

EEE 381 PROCESS CONTROL

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

Introduction to process control. Analog and digital signal conditioning. Sensors: Thermal, mechanical, optical. Final control: Industrial electronics, actuators, control elements. Discrete-state process control: Relay controllers and ladder diagram, PLCs. Controller principles: Control system parameters, controller modes. Analog controllers. Digital control: Computers in digital control, process-control networks. Control-loop characteristics.

Course Objective:

To provide an overview of process control and give introductory concepts. To provide the dynamic behavior of processes. To consider feedback and feed-forward control methods for process control.

Course Content:

- Introduction to Process Control
- Theoretical Models of Chemical Processes
- Laplace Transforms, Transfer Function and State-Space Models
- Dynamic Behavior of First-Order and Second-Order Processes
- Dynamic Response Characteristics of More Complicated Processes
- Development of Empirical Models from Process Data
- Feedback Controllers
- Control System Instrumentation
- Overview of Control System Design
- Dynamic Behavior and Stability of Closed-Loop Control Systems
- PID Controller Design, Tuning, and Troubleshooting
- Frequency Response Analysis
- Control System Design Based on Frequency Response Analysis
- Feed-forward and Ratio Control

References:

- Process Dynamics and Control, D.E. Seborg, T.F. Edgar, D.A. Mellichamp, 2004, 2nd Edition, John Wiley & Sons, Inc. ISBN: 978-0-471-00077-8. Book Web page: www.wiley.com/college/seborg
- Practical Process Control Using Control Station 3.7, Doug J. Cooper, 2004, Control Station LLC. Book Web page: www.controlstation.com
- Process Control Instrumentation Technology, Curtis D. Johnson, 2006, 8th Edition, Prentice Hall. ISBN: 0-13-197669-9. Book Web page: www.uh.edu/~tech13v/pcit

EEE 382 PROCESS INSTRUMENTATION AND CONTROL

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

This course focuses on the four major areas in automatic control systems: primary measurements, signal transmission, automatic controllers, and the final control elements. Describing typical installations as applied in various pulp and papermaking processes shows how these areas work together as systems. This course also provides a basic introduction to computers and their use in the paper industry.

Course Objective:

Upon successful completion of this course, the student should be able to:

- define primary measurement and signal transmission principles and equipment.
- define the use of automatic controllers in automated control systems.
- describe the use of final control elements in automated control systems.
- explain measurement, signal transmission, controller, and control element applications for common process variables in the paper industry.
- explain how computers are utilized in control systems in the pulp and paper industry.

Course Content:

- Course Introduction
- Instrumentation and Control Methods/Equipment
- Pressure Measurement
- Level Measurement
- Flow Measurement
- Temperature Measurement
- Analytical Measurement
- Density and Specific Gravity Measurement
- Viscosity Measurement
- Consistency Measurement
- Humidity Measurement
- Moisture Measurement
- Speed Measurement
- Freeness Measurement
- Basic Weight Measurement
- Thickness Measurement
- Quality Measurement
- Signal Transmission
- Automatic Control
- Final Control Elements
- Process Applications
- Computers in the Paper Industry

References:

- Platt, George. Process Control - A Primer for the Nonspecialist, 2nd Ed., TAPPI Publications, 1998.
- Smook, G.M. Handbook for Pulp and Paper Technologist, 3rd Ed., Atlanta, GA: TAPPI Publications, 2002. (Chapter 24: Process Control)

EEE 383 DISCRETE TIME CONTROL SYSTEMS

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

Review of discrete-time systems and the z-transform. z-plane analysis of discrete-time control systems: Sampling and reconstruction, the pulse transfer function, realization of digital controllers and digital filters. Stability analysis of closed-loop systems in the z-plane, transient and steady-state response analysis. State-space analysis. Pole placement and observer design. Polynomial equations approach to control systems design. Quadratic optimal control systems.

Course Objective:

A working knowledge of representation, analysis and design of computer control systems. Time-domain representation of discrete-systems, frequency domain analysis (z-transform), state space techniques and introduction to the design of computer controller schemes. To model and analyze computer-controlled systems using simulation tools like MATLAB. Emulating real-time computer controlled systems with the use of analog computers, analog-to-digital and digital-to-analog converters. To design, implement, and verify computer controlled systems with all these tools combined.

Course Content:

- Introduction. Digital control systems. Quantizing and quantization error.
- Data acquisition, conversion, and distribution systems.
- Introduction. The z transform. z transforms of elementary functions.
- Important properties and theorems of the z transform. The inverse z transform. z transform method for solving difference equations.
- z-Plane Analysis of Discrete-Time Control Systems
- Introduction. Mapping between the s plane and the z plane. Stability analysis of closed-loop systems in the z plane. Transient and steady-state response analysis.
- Introduction. Mapping between the s plane and the z plane. Stability analysis of closed-loop systems in the z plane. Transient and steady-state response analysis.
- Design based on the root-locus method. Design based on the frequency-response method. Analytical design method.
- Design based on the root-locus method. Design based on the frequency-response method. Analytical design method.
- Introduction. State-space representations of discrete-time systems. Solving discrete-time state-space equations.
- Introduction. State-space representations of discrete-time systems. Solving discrete-time state-space equations.
- Pulse-transfer-function matrix. Discretization of continuous-time state-space equations. Liapunov stability analysis.
- Pulse-transfer-function matrix. Discretization of continuous-time state-space equations. Liapunov stability analysis.

References:

- Discrete-Time Control Systems, Katsuhiko Ogata, 2000, 2nd Edition, Prentice Hall. ISBN: 0-13-034281-5

EEE 391 HDL BASED LOGIC CONTROL

Eurpean Credit Transfer System Credit Distribution Table			
T	P	C	ECTS
3	0	3	5

Course Description:

Introduction to electronic design automation. Hardware modeling in HDL. Event-driven simulation and testbenches. Logic System, data types, and operators for modeling in HDL. User-defined primitives. Propagation delay models. Behavioral descriptions in HDL. Synthesis of combinational logic. Synthesis of sequential logic. Synthesis of language constructs. Switch-level models. Rapid prototyping with Xilinx FPGAs.

Course Objective:

To learn HDL based logic design.

Course Content:

- Introduction to HDLs
- Combinatorial design with VHDL
- Process, Procedure and Functions in VHDL
- Case studies

References:

- VHDL Starters Guide Sudhakar Yalamanchili Publisher: Prentice Hall , ISBN: 0-13-145735-7 Copyright: 2005

EEE 392 EMBEDDED SYTEMS

Europan credit transfer system credit distrubition table			
T	P	C	ECTS
3	0	3	5

Course Description:

This is practically-orientated and advanced course in the area of electronics design and applications. It is distinctive in that it provides a strong digital technology core backed up with applications-led modules. Examples of these applications include medical and electronics, e-health, intelligent building design, automotive electronics, retail and commerce. Another feature of the course is the substantial amounts of practical work, giving students the confidence with software and digital hardware implementations using microcontrollers or general system-on-chip the methodology.

Course Contents

- Embedded Microcontrollers: Choosing and using microcontrollers for embedded system design.
- The AT89C51ED2 series microcontrollers. Development environments for embedded software.
- Sensors and Sensory processing: Software aspects of sensory interfacing. Sampling. Analog acquisition. Position and Velocity Measurements. Encoders. Quadrature Decoding.
- Actuators and interfacing: Pulse Width Modulation (PWM). DC motors. Amplifiers. Programming with actuators.
- Basic control theory: Principles of feedback, logic control and finite state machines. Software architectures for implementing controllers.
- Real-time operating systems:Interrupts. Shared data. Latency. Round-robin architectures. Single vs. multitasking. Semaphores. Real time computation.
- Communication protocols:Communicating between multiple microcontrollers. RS232, I2C, CAN protocols. Designing distributed applications.

Teaching Methods:

Lecture is executed by explaining and discussing the subjects, and by solving problems connected with the subjects. A term project is given to students. The presentation of the course is supported by use of projectors, blackboards, and laboratory educational kits. The books related with the subjects are proposed in order to support the course.

References:

- The 8051 Family of Microcontrollers, R.H. Barnett, 1995, Prentice Hall
- The 8051 Microcontroller, I.Scott MacKenzie, 1995, Prentice Hall
- Programming and Interfacing the 8051, S.Yeralan, A. Ahluwalia, 1995 Addison Wesley
- Microprocessor and Microcontroller Fundamentals, William Kleitz, 1998, Prentice Hall
- Programming and Customizing the 8051 Microcontroller, Myke Predko, 1999, Mc Graw Hill

Additional references:

- www.atmel.com.tr
- http://www.cs.bilkent.edu.tr/~saranli/courses/cs431/documents/8051_tutorial.pdf http://www.cs.bilkent.edu.tr/~saranli/courses/cs431/documents/mcs51_guide.pdf