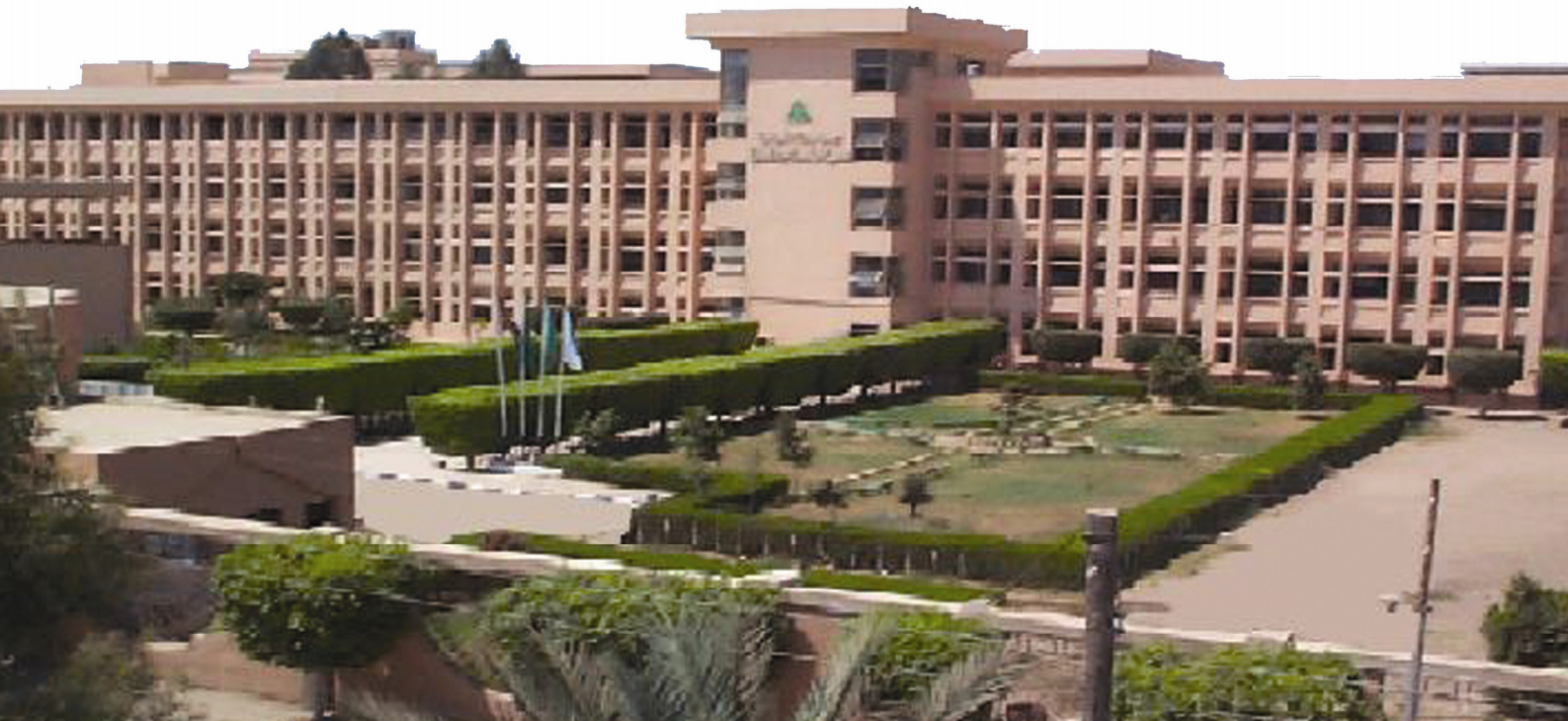
Minoufiya University
Faculty of Electronic Engineering

BSc Programs

Electronic Engineering

2012



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Introduction

The Faculty Vision:

The Faculty of Electronic Engineering aspires to have top leading position among the international distinguished Engineering institution.

The Faculty Mission:

The mission of the Faculty of Electronic Engineering, Minufiya University is to graduate competent engineers in different electronic engineering disciplines. The Faculty offers distinguished academic programs to support graduate with basic knowledge and skills that satisfy the national and international standard. The graduates are trained to lead engineering projects in their disciplines with deep conscious of society and environment problems and ethics. The mission is extended to provide post graduate programs, research and engineering consulting to serve the requirement of the society and work field.

Tables of Courses

General Years:

- **Preparatory Year**
- **First Year**
- **Second Year**

Minoufiya University
Faculty of Electronic Engineering
Preparatory Year

First Semester

Code	Subject	Weekly Hours					Maximum Mark			Total	Exam Time (hours)
		Lec.	Exercise			Total	Work	Oral	Written		
			Theory	Lab	Pract						
PME 011	Mathematics (1)	3	2			5	50		100	150	3
PME 012	Physics (1)	2	1	2		5	30	30	90	150	3
PME 013	Chemistry	3		2		5	30	30	90	150	3
CSE 014	Logic Design	2		2		4	20	20	60	100	3
UR 015	English Language	2				2	15		35	50	2
FR 016	Engineering Drawing and Descriptive Geometry (1)	2	2			4	30		70	100	3
UR 017	Communication and Presentation Skills	2	2			4	15		35	50	2
Total		16	7	6	0	29				750	

Second Semester

Code	Subject	Weekly Hours					Maximum Mark			Total	Exam Time
		Lec.	Exercise			Total	Work	Oral	Written		
			Theory	Lab	Pract						
PME 021	Mathematics (2)	3	2			5	50		100	150	3
PME 022	Physics (2)	2	1	2		5	30	30	90	150	3
PME 023	Mechanics	2	2			4	30		70	100	3
CSE 024	Computer Languages	2		2		4	20	20	60	100	3
PME 025	Production Engineering	2			2	4	20	20	60	100	3
FR 026	Engineering Drawing and Descriptive Geometry (2)	2	2			4	30		70	100	3
UR 027	Engineering History	2				2	15		35	50	2
Total		15	7	4	2	28				750	

Minoufiya University
Faculty of Electronic Engineering
First Year

First Semester

Code	Subject	Weekly Hours					Maximum Mark			Total	Exam Time (hours)
		Lec.	Exercise			Total	Work	Oral	Written		
			Theory	Lab	Pract						
PME 111	Mathematics (3)	3	2			5	50		100	150	3
PME 112	Physics (3)	2	1	2		5	30	30	90	150	3
ECE 113	Electronics (1)	2	1	1		4	20	20	60	100	3
ECE 114	Electronic circuits and component drawing	2	1	1		4	20	20	60	100	3
ACE 115	Electrical Engineering	2	1	1		4	20	20	60	100	3
CSE 116	Data Structures and Algorithms	2		2		4	20	20	60	100	3
UR 117	Environmental Engineering	2	1			3	15		35	50	2
Total		15	7	7		29				750	

Second Semester

Code	Subject	Weekly Hours					Maximum Mark			Total	Exam Time (hours)
		Lec.	Exercise			Total	Work	Oral	Written		
			Theory	Lab	Pract						
PME 121	Mathematics (4)	3	2			5	50		100	150	3
ECE 122	Semiconductor technology	2	1			3	30		70	100	3
ECE 123	Electronics (2)	2	1	1		4	20	20	60	100	3
ACE 124	Electrical Power	2	1		2	5	30	30	90	150	3
ACE 125	Electrical Measurements	2		1		3	20	20	60	100	3
CSE 126	Computer Organization	2	2			4	30		70	100	3
UR 127	Projects Management	2	1			3	15		35	50	2
Total		15	8	2	2	27				750	

Minoufiya University
Faculty of Electronic Engineering
Second Year

First Semester

Code	Subject	Weekly Hours					Maximum Mark			Total	Exam Time (hours)
		Lec.	Exercise			Total	Work	Oral	Written		
			Theory	Lab	Pract						
PME 211	Mathematics (5)	3	2			5	50		100	150	3
ECE 212	VLSI Technology	2	1			3	30		70	100	3
ECE 213	Electrical Circuits	2	1			3	30		70	100	3
ECE 214	Fields and waves	2	1			3	30		70	100	3
ACE 215	Control Engineering	2	1			3	30		70	100	3
ACE 216	Power Electronics	2	1			3	30		70	100	3
CSE 217	Microprocessors and Applications	2		2		4	20	20	60	100	3
Total		15	7	2		24				750	

Second Semester

Code	Subject	Weekly Hours					Maximum Mark			Total	Exam Time (hours)
		Lec.	Exercise			Total	Work	Oral	Written		
			Theory	Lab	Pract						
PME 221	Mathematics (6)	3	2			5	50		100	150	3
ECE 222	Communication Engineering	2	1			3	30		70	100	3
ECE 223	Electronic Circuits	2	1		2	5	30	30	90	150	3
ACE 224	Electrical Machines	2	1			3	30		70	100	3
ACE 225	Microcontrollers	2	1	1		4	20	20	60	100	3
CSE 226	Database Systems	2		2		4	20	20	60	100	3
UR 227	Report Writing	2	2			4	15		35	50	2
Total		15	8	3	2	28				750	

Tables of Courses

Department:

Electronics and Electrical Communication Engineering

- **Third Year**
- **Fourth Year**

Minoufiya University
Faculty of Electronic Engineering
Department: Electronics and Electrical Communication Engineering
Third Year

First Semester

Code	Subject	Weekly Hours					Maximum Mark			Total	Exam Time (hours)
		Lec.	Exercise			Total	Work	Oral	Written		
			Theory	Lab	Pract						
ECE 311	Digital Communication	2	1	1		4	30	30	90	150	3
ECE 312	Electromagnetic waves	2	1	1		4	30	30	90	150	3
ECE 313	Acoustics and Ultrasonics	2	1			3	30		70	100	3
ECE 314	Network Theory	2	1			3	30		70	100	3
ECE 315	Elective Course (1)	2	1			3	30		70	100	3
ECE 316	Elective Course (2)	2	1			3	30		70	100	3
UR 317	Professional ethics and product quality	2	1			3	15		35	50	2
Total		14	7	2		23				750	

Second Semester

Code	Subject	Weekly Hours					Maximum Mark			Total	Exam Time (hours)
		Lec.	Exercise			Total	Work	Oral	Written		
			Theory	Lab	Pract						
ECE 321	Communication Circuits	2	1			3	30		70	100	3
ECE 322	Digital Signal Processing	2		1		3	20	20	60	100	3
ECE 323	Microwave Engineering	2	1	1		4	30	30	90	150	3
ECE 324	Mobile Communication Systems	2		1		3	20	20	60	100	3
ECE 325	Optoelectronics	2	1			3	30		70	100	3
ECE 326	Elective Course (3)	2	1			3	30		70	100	3
ECE 327	Elective Course (4)	2	1			3	30		70	100	3
Total		14	5	3		22				750	

Minoufiya University
Faculty of Electronic Engineering
Department: Electronics and Electrical Communication Engineering
Fourth Year

First Semester

Code	Subject	Weekly Hours					Maximum Mark			Total	Exam Time (hours)
		Lec.	Exercise			Total	Work	Oral	Written		
			Theory	Lab	Pract						
ECE 411	Antenna Engineering	2	1	1		4	30	30	90	150	3
ECE 412	Microwave Electronics	2	1			3	30		70	100	3
ECE 413	Information Theory and Coding	2	1			3	30		70	100	3
ECE 414	Computer Networks	2	1	1		4	30	30	90	150	3
ECE 415	Optical Communications	2	1	1		4	30	30	90	150	3
ECE 416	Elective Course (5)	2	1			3	30		70	100	3
ECE 417	Project	1			3	4					
Total		13	6	3	3	25				750	

Second Semester

Code	Subject	Weekly Hours					Maximum Mark			Total	Exam Time (hours)
		Lec.	Exercise			Total	Work	Oral	Written		
			Theory	Lab	Pract						
ECE 421	Satellite Engineering	2		1		3	20	20	60	100	3
ECE 422	Radar systems	2		1		3	20	20	60	100	3
ECE 423	Advanced Communication Systems	2	1			3	30		70	100	3
ECE 424	Network Planning	2	1			3	30		70	100	3
UR 425	Engineering Economics and Legislations	2	1			3	15		35	50	2
ECE 426	Elective Course (6)	2	1			3	30		70	100	3
ECE 427	Project	1			3	4	100	100		200	
Total		13	4	2	3	22				750	

Elective Courses

Department:

Electronics and Electrical Communication Engineering

Third Year

First Semester:

Elective Course [1]:

- **A1. Mechatronics Engineering**
- **B1. Digital Exchanges**
- **C1. Random Variables and random processes**

Elective Course [2]:

- **D1. Digital Image processing**
- **E1. Surface Acoustic Wave Devices**
- **F1. Electromagnetic Compatibility**

Second Semester:

Elective Course [3]:

- **A2. Neural Networks**
- **B2. Information Security Systems**
- **C2. Modeling and Simulation**

Elective Course [4]:

- **D2. Speech processing**
- **E2. Superconducting Circuits**
- **F2. Biomedical Imaging**

Fourth Year

First Semester:

Elective Course [5]:

- **A3. Integrated Circuit Design**
- **B3. Sensor Networks**
- **C3. Broadcasting and television Engineering**

Second Semester:

Elective Course [6]:

- **D3. Pattern Recognition**
- **E3. Nano Devices**
- **F3. Numerical Methods in Electromagnetic**

Tables of Courses

Department:
Industrial Electronics and Control Engineering

- **Third Year**
- **Fourth Year**

Minoufiya University
Faculty of Electronic Engineering
Department: Industrial Electronics and Control Engineering
Third Year

First Semester

Code	Subject	Weekly Hours					Maximum Mark			Total	Exam Time (hours)
		Lec.	Exercise			Total	Work	Oral	Written		
			Theory	Lab	Pract						
ACE 311	Electronic Measurements	2	1			3	30		70	100	3
ACE 312	Linear Control Systems	2	1			3	30		70	100	3
ACE 313	Microcontrollers Applications	2		2		4	30	30	90	150	3
ACE 314	Biomedical Electronics	2	1	1		4	30	30	90	150	3
ACE 315	Control systems Applications (1)	1		2		3	20	20	60	100	3
ACE 316	Elective (1)	2	1			3	30		70	100	3
UR 317	Professional ethics and product quality	2	1			3	15		35	50	2
Total		13	5	5		23				750	

Second Semester

Code	Subject	Weekly Hours					Maximum Mark			Total	Exam Time (hours)
		Lec.	Exercise			Total	Work	Oral	Written		
			Theory	Lab	Pract						
ACE 321	Nonlinear Control Systems	2	1			3	30		70	100	3
ACE 322	Robotics	2	1			3	30		70	100	3
ACE 323	Digital Control Systems	2	2			4	50		100	150	3
ACE 324	Industrial Electronics	2	1			3	30		70	100	3
ACE 325	Control systems Applications (2)	1		2		3	20	20	60	100	3
ACE 326	Elective (2)	2	1			3	30		70	100	3
ACE 327	Elective (3)	2	1			3	30		70	100	3
Total		13	7	2		22				750	

Minoufiya University
Faculty of Electronic Engineering
Department: Industrial Electronics and Control Engineering
Fourth Year

First Semester

Code	Subject	Weekly Hours					Maximum Mark			Total	Exam Time (hours)
		Lec.	Exercise			Total	Work	Oral	Written		
			Theory	Lab	Pract						
ACE 411	Programmable Logic Controllers	2		2		4	30	30	90	150	3
ACE 412	Real Time Control Systems	2	2			4	50		100	150	3
ACE 413	Medical Instrumentation	2	1	1		4	30	30	90	150	3
ACE 414	Control systems Applications (3)	1		2		3	20	20	60	100	3
ACE 415	Elective (4)	2	1			3	30		70	100	3
ACE 416	Elective (5)	2	1			3	30		70	100	3
ACE 417	Project	1			3	4	-	-	-	-	-
Total		12	5	5	3	25				750	

Second Semester

Code	Subject	Weekly Hours					Maximum Mark			Total	Exam Time (hours)
		Lec.	Exercise			Total	Work	Oral	Written		
			Theory	Lab	Pract						
ACE 421	Industrial automation Systems	2	1			3	30		70	100	3
ACE 422	Applications of Industrial Electronics	2	1			3	30		70	100	3
ACE 423	Intelligent Control Systems	2	1			3	30		70	100	3
ACE 424	Control systems Applications (4)	1		2		3	20	20	60	100	3
UR 425	Engineering Economics and Legislations	2	1			3	15		35	50	2
ACE 426	Elective (6)	2	1			2	30		70	100	3
ACE 427	Project	1			3	4	100	100		200	3
Total		12	5	2	3	22				750	

Elective Courses

Department:

Industrial Electronics and Control Engineering

Third Year

First Semester:

Elective Course [1]:

- A1-Advanced control systems -1
- B1- Mechatronic-1
- C1- Medical - 1

Second Semester:

Elective Course [2]:

- A2-Advanced control systems-2
- B2-Mechatronic-2
- C2-Medical-2

Elective Course [3]:

- A3-Advanced Computing-1
- B3-Communication system in process control
- C3-Computer network

Fourth Year

First Semester:

Elective Course [4]:

- A4-Advanced control systems-3
- B4-Mechatronic-3
- C4-Medical-3

Elective Course [5]:

- A5-Applications of PLC in process control
- B5-Renewable energy
- C5-Applications of microcontroller in process control

Second Semester:

Elective Course [6]:

- A6-Industrial Electronic Application
- B6-Mechatronic-4
- C6-Medical-4

Tables of Courses

Department:

Computer Science and Engineering

- **Third Year**
- **Fourth Year**

Minoufiya University
Faculty of Electronic Engineering
Department: Computer Science and Engineering
Third Year

First Semester

Code	Subject	Weekly Hours					Maximum Mark			Total	Exam Time (hours)
		Lec.	Exercise			Total	Work	Oral	Written		
			Theory	Lab	Pract						
CSE 311	Computer Architecture	2	1			3	30		70	100	3
CSE 312	Advanced Programming Languages	2		2		4	30	30	90	150	3
CSE 313	Computer Networks	2		2		4	30	30	90	150	3
CSE 314	Artificial Intelligence	2	1			3	30		70	100	3
CSE 315	Elective Course (1)	2	1			3	30		70	100	3
CSE 316	Elective Course (2)	2	1			3	30		70	100	3
UR 317	Professional ethics and product quality	2	1			3	15		35	50	2
Total		14	5	4		23				750	

Second Semester

Code	Subject	Weekly Hours					Maximum Mark			Total	Exam Time (hours)
		Lec.	Exercise			Total	Work	Oral	Written		
			Theory	Lab	Pract						
CSE 321	Parallel Processing	2	1			3	30		70	100	3
CSE 322	Software Engineering	2		2		4	30	30	90	150	3
CSE 323	Advanced Computer Networks	2		1		3	20	20	60	100	3
CSE 324	Operating Systems	2		1		3	20	20	60	100	3
CSE 325	Image Processing	2	1			3	30		70	100	3
CSE 326	Elective Course (3)	2	1			3	30		70	100	3
CSE 327	Elective Course (4)	2		1		3	20	20	60	100	3
Total		14	3	5		22				750	

Minoufiya University
Faculty of Electronic Engineering
Department: Computer Science and Engineering
Forth Year

First Semester

Code	Subject	Weekly Hours					Maximum Mark			Total	Exam Time (hours)
		Lec.	Exercise			Total	Work	Oral	Written		
			Theory	Lab	Pract						
CSE 411	Distributed Systems	2	1			3	30		70	100	3
CSE 412	Compiler Design	2		2		4	30	30	90	150	3
CSE 413	Network security	2	1	1		4	30	30	90	150	3
CSE 414	Advanced Database	2		2		4	30	30	90	150	3
CSE 415	Multimedia	2	1			3	30		70	100	3
CSE 416	Elective Course (5)	2	1			3	30		70	100	3
CSE 417	Graduation Project	1			3	4	-	-	-	-	-
Total		13	4	5	3	25				750	

Second Semester

Code	Subject	Weekly Hours					Maximum Mark			Total	Exam Time (hours)
		Lec.	Exercise			Total	Work	Oral	Written		
			Theory	Lab	Pract						
CSE 421	Embedded Systems	2		1		3	20	20	60	100	3
CSE 422	Advanced Software Engineering	2		1		3	20	20	60	100	3
CSE 423	Network Programming	2		1		3	20	20	60	100	3
CSE 424	Advanced Operating System	2		1		3	20	20	60	100	3
UR 425	Engineering Economics and Legislations	2	1			3	15		35	50	3
CSE 426	Elective Course (6)	2	1			3	30		70	100	3
CSE 427	Graduation Project	1			3	4	100	100		200	
Total		13	2	4	3	22				750	

Elective Courses

Department:

Computer Science and Engineering

Third Year

First Semester:

Elective Course [1]:

- A1. Computer Graphics
- B1. Neural Networks
- C1. Computer Peripherals

Elective Course [2]:

- D1. Formal Languages and Automata
- E1. Computer and Information Security
- F1. Modeling and Simulation

Second Semester:

Elective Course [3]:

- A2. Advanced Computer Graphics
- B2. Expert Systems
- C2. Optical Computers

Elective Course [4]:

- D2. Data Mining
- E2. High performance Computers
- F2. Bioinformatics

Fourth Year

First Semester:

Elective Course [5]:

- A3. Computer vision
- B3. Multi Agent System
- C3. Advanced topics in computer Engineering-1

Second Semester:

Elective Course [6]:

- D3. Distributed Database
- E3. Microcontroller System Design
- F3. Advanced topics in computer engineering-2

Syllabus of Courses

Preparatory Year

Preparatory Year

First Semester:

Code	PME 011				
Title	Engineering Mathematics (1)				
Field	Mathematics and Basic Science				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	3	2			5
Syllabus	Calculus of differentiation: Classifications of functions – Limits of functions – Theorems of limits (Cauchy theorem – L'Hopital rule) – Continuity of functions – Types of discontinuity – Smooth function – Trigonometric functions and its inverse Exponential function – Logarithmic function – Hyperbolic functions and its inverse – Differentiation of functions (First and Higher derivatives) Differentiation study of (Exponential functions – Logarithmic functions Trigonometric functions, Hyperbolic functions and their inverse) Applications of differentiation (Roll's theorem – Mean value theorem) Taylor theorem (Taylor and Maclurin expansion of functions). Partial differentiation: Multiple variable functions – First and Higher partial derivatives of multiple variable functions – Complete differentiation and Chain rule – Extrema and Lagrange multiplier – Engineering application on partial differentiation. Analytical geometry: Conic sections (Parabola – Ellipse – Hyperbolic) – Quadratic surfaces. Infinite series: Infinite series – Convergent and divergent series – Tests of convergence and divergence series – Power series – Radius and interval of convergence of a power series.				

Code	PME 012				
Title	Engineering Physics (1)				
Field	Mathematics and Basic Science				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1	2		5
Syllabus	Physical quantities – units and dimensions – field of gravitational force – fluid static's and dynamics – viscosity – elasticity- sound waves – waves in elastic media – heat transfer – Kinetic theory of gases – first and second laws of thermodynamics – entropy.				

Code	PME 013				
Title	**Chemistry**				
Field	Mathematics and Basic Science				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	3		2		5
Syllabus	Ions in Solution: Metallic conductors – Faraday's law – Ionic theory – Measurement of conductivity. Electrochemistry (Equilibrium in Redox systems): Electrochemical cells- e.m.f of cells – standard hydrogen electrode - Measurement of pH. Chemical equilibrium: Equilibrium law – Equilibrium constant- Le Chatelier's Principle- Acids & Bases – Ionic product of H2O & pH.-Buffer solutions-Hydrolysis of salts. Solids: Types of solids – X-ray diffraction – Crystal structure - Types of Crystal structures- Common structure of salts- Crystal structure of Metals-Crystal system. Semiconducting elements: Boron-Silicon and Germanium-Arsenic – Antimony – Selenium – Tellarium – Semiconductivity – Compounds of semiconducting elements-applications. The Gaseous State: Physical Properties of Gases - The Laws of Gases -The Kinetic Theory of Gases - Deviation from the ideal Gas Laws - Liquefaction of Gases- applications of gases in industry. Solutions: Gases in liquids and solid solutions -Liquids in liquids solutions -Raoult's Law - Distillation of liquids - Solids in liquids solutions - Dilute Solution of Non-electrolytes -Solids in solids solutions. Polymer: Organic electronics - Types and classification of polymers - Addition polymer - Condensation polymer – application of polymers in electronics industies. Phase Rule: Phase-Component-Degree of Freedom- Gibb's Rule - Phase diagram of water, Phase diagram of carbon dioxide. Thermochemistry: Endothermic and exothermic Reaction -the first law of thermodynamics Heat content or enthalpy - Enthalpies of reaction -Thermochemical equations: Hess's law of constant heat summation - Spontaneous Process Entropy and the second law of thermodynamics. Nuclear Chemistry: What Is Radioactivity-Nuclear Reactions vs. Normal Chemical Reactions, Nuclear Reactions - Types of Radioactive Decay Nuclear Fission - A nuclear power plant- Nuclear Fusion - applications				

Code	CSE 014				
Title	**Logic Design**				
Field	Computer Applications and ICT				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2		2		4
Syllabus	Review of Data and number systems (Binary representation, Codes and their conversions: BCD, Octal, Hexadecimal, ASCII, Gray) - Signed binary number representation with 1's and 2's complement methods, Binary arithmetic, Boolean algebra, logic gates and circuits, Minimization of logic expressions by algebraic method, K-map method - Combinational circuits- adder,				

	subtractor, encoder, decoder, comparator, multiplexer, de-multiplexer, parity generator, etc. Design of combinational circuits-Programming logic devices and gate arrays. Sequential Circuits: Flip Flops, various types of Registers and counters and their design, Irregular counter, State table and state transition diagram, sequential circuits design methodology**.**

Code	**UR 015**				
Title	**English Language**				
Field	**Humanities and Social Science (Univ. Req.)**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2				**2**
Syllabus	Remedial English. Review of common errors, e. g incomplete sentences, misuse of tenses, confusion of spelling, inaccurate usage of idioms and collocation patterns. Intensive practice in extended English sentence structures, idioms, usage. Word-forms are explained to enhance vocabulary development and expansion.				

Code	**FR 016**				
Title	**Engineering Drawing and Descriptive Geometry 1**				
Field	**College Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2	**2**			**4**
Syllabus	Intersection of solids. Revolved, removed, and auxiliary projections. Construction of a third view for machine elements. Sectional views, cutting plane, types of sections. Introduction to fasteners and assembly drawing.				

Code	**UR 017**				
Title	**Communication and Presentation Skills**				
Field	**Humanities and Social Science (Univ. Req.)**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2	**2**			**4**
Syllabus	The theories process and methods of communication is discussed with its related concepts. Human relationship.				

Second Semester

Code	PME 021				
Title	**Engineering Mathematics (2)**				
Field	Mathematics and Basic Science				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	3	2			5
Syllabus	Calculus of integration: Infinite and definite integrals – Infinite and definite integrals of (Algebraic functions – Trigonometric functions and its inverse – Exponential function – Logarithmic function – Hyperbolic functions and its inverse) – Methods of integration (Integration by parts – Reduction formulas and Walas laws – Integration by substitution – Integration by partial fractions) Application of integration (Areas – Volumes and solid of revolution Arc-length and surface of revolution) in Cartesian, parametric and polar coordinates – Improper integrals. Theory of equations: Fundamental theorem – Relation between roots and the coefficients – Repeated roots – Rational roots – Approximate roots of equations (Graphical methods – Newton's method). Matrices: Definition and kinds of matrices – Algebra of matrices – Inverse matrix – Rank of matrix – Reduced of matrix – Solution of system of equations using inverse matrix – Eigenvalues and Eigenvectors of a matrix. Systems of algebraic equations: Solution of homogenous and non-homogenous algebraic systems of square equations using (Gauss-Jordan method) – Iterative methods for solving algebraic systems of square equations using (Jacobi's method – Convergence conditions – Gauss-seidel's method – Convergence conditions).				

Code	PME 022				
Title	**Engineering Physics (2)**				
Field	Mathematics and Basic Science				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1	2		5
Syllabus	Charge and matter – electric field – Gauss law – electric potential – capacitors and dielectrics – current, resistance and electromotive force – magnetic field – Ampere's law and Biot-Savart law – Faraday's law of induction – inductance – magnetic properties of matter – Maxwell's equation – Geometrical optics and fiber optics.				

Code	PME 023				
Title	**Mechanics**				
Field	Mathematics and Basic Science				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	2			4
Syllabus	Firstly: Statics: Vectors (definition of vectors in space – Algebra of vectors – The moment of forces around point and line, and moment of a couples) – Reduction of non-concurrent forces in space to one force and couple or to one force – Theorem of the equilibrium forces in the space – Virtual work – Centroid – Moment of inertia. Secondly: Dynamics: Linear motion (Motion of a particle in a straight line – Motion in a resistant medium – Simple harmonic motion) – Plane motion (Plane motion in Cartesian coordinates, in Polar coordinates and in Inertial coordinates – Circular motion Projectiles) – Impulse and Impact – Motion of charged particle in electrical and magnetic field.				

Code	CSE 024				
Title	**Computer Languages**				
Field	Computer Applications and ICT				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2		2		4
Syllabus	The course acquaints the students with the role and uses of computer with respect to programming languages. It first introduces the students to the concept of computer programming and different types of computer languages. It then presents the basics of C++ programming language including: C++ program structure, variables, data types and constants, standard data types, arithmetic expressions and operations. Next, it introduces the c++ statements including: input/output statements, flow control statements (if statement, if else statement, nested if and switch case statement), iterative statements (for loop, while loop and do while loop). It also introduces the compound data types including: structure, arrays and pointers. Follow, it presents the functions including passing parameters and function overloaded, macros and recursion. Finally, the course introduces the basic elements of any object oriented programming language: classes and objects.				

Code	PME 025				
Title	**Production Engineering**				
Field	Practical and projects				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2			2	4
Syllabus	The aim of this course is to give all engineering students a simple introduction and general knowledge about the engineering materials, the primary processes for producing semi finished products, cutting and non-cutting processes for producing final products, the inspection by using different measuring equipment and an idea about industrial organization and safety. The basic operations that can be achieved in workshop such as measurements, wood working, sheet-metal working, bench working, forging, casting, machining and welding techniques which are presented the basic essentials of manufacturing that all engineering student should grasp by the time they begin their industrial career.				

Code	FR 026				
Title	**Engineering Drawing and Descriptive Geometry 2**				
Field	College Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	2			4
Syllabus	Intersection of solids. Revolved, removed, and auxiliary projections. Construction of a third view for machine elements. Sectional views, cutting plane, types of sections. Introduction to fasteners and assembly drawing.				

Code	UR 027				
Title	**Engineering History**				
Field	Humanities and Social Science (Univ. Req.)				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2				2
Syllabus	Definition of art, science, technology and engineering. Definition of Cultural heritage, its source, ups and downs, objectives and motivations, throwing light on some of the scientific facts brought about by human civilization. Relation between of engineering development and society development. Development of selected industries (textiles, garment, plastics, refrigeration, pumps, electric, etc.).				

Syllabus of Courses

First Year

First Year

First Semester

Code	PME 111				
Title	**Engineering Mathematics (3)**				
Field	Mathematics and Basic Science				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	3	2			5
Syllabus	Differential equations with constant coefficients: First order differential equations – Different methods for solving first order differential equations (Separable equations – Homogenous equations Exact equations – Integrating factors – Linear equations – Bernoulli equations) – Second order differential equations (homogenous and non-homogenous) – Different methods for solving second order differential equations using (Differential operator – Undetermined coefficients – Variation of parameters) – Solution of Euler and Lagrange differential equations – Solution of higher order differential equations – Engineering applications on differential equations – Solution of differential equations systems using (Differential operator method – Inverse matrix method). Differential equations with variable coefficients: Series solution of differential equations by using different method (Maclurin series for solving differential equations about ordinary points – Frobenius series for solving differential equations about regular singular points). Laplace Transforms: Definition of Laplace transforms – Laplace transforms of different functions and their derivatives – Laplace transforms of discrete and periodic functions – Properties of Laplace transforms – First shift property Laplace transform of unit-step function – Second shift property – Inverse Laplace transform – Evaluation of inverse Laplace transforms – Solution of differential equations using Laplace transform – Transfer functions – Engineering applications of Laplace transforms. Analytical geometry in space: Vector equations of straight line – Vector equations of plane – Cylindrical and spherical coordinates.				

Code	PME 112				
Title	**Engineering Physics (3)**				
Field	Mathematics and Basic Science				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1	2		5
Syllabus	Basics of quantum mechanics – Band Theory- Semiconductor Physics- X-ray and its applications – crystal structure of solids – Optical properties of solids- Superconductivity- Nanostructure.				

Code	ECE 113				
Title	**Electronics 1**				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1	1		4
Syllabus	Semiconductor physics – Semiconductors – Diffusion current in P-N junction – Biasing of P-N junction – Different types of P-N junctions – Electron ballistics – Semiconductor diodes application – Zener diodes and other elements- Light emitting diodes- Solar cells- photodiodes- liquid crystal display.				

Code	ECE 114				
Title	**Electronic circuits and component drawing**				
Field	College Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1	1		4
Syllabus	Drafting techniques of electronic designs - Electronic Components Standards - Electronic Symbols Drawing. Schematic Diagram Drawing - Connection Diagrams Drawing - Block Diagrams Drawing – Wiring and Pictorial Diagram Drawing - Printed Circuit Boards (Single and Multi-Layers) Drawing. Assembly and Detailed Drawing of Electronic Components – Block and Logic Diagrams Drawing - Computer Aided Drawing For Electronic Symbols - Computer Aided Drawing For Printed Circuit Boards.				

Code	ACE 115				
Title	**Electrical Engineering**				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1	1		4
Syllabus	Fundamentals of Electricity – Magnetism- Electromagnets – Magnetic field due to straight conductor and circular conductor- Nature of magnetic field of long straight conductor – Magneto motive force – Electromagnetic induction – Electrostatics – A.C fundamentals – Polyphase Fundamentals – transformer.				

Code	CSE 116				
Title	**Data Structures and Algorithms**				
Field	Computer Applications and ICT				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2		2		4
Syllabus	This course covers data structures and algorithms using C++ language. It first presents the elementary of static data structures (structure and arrays) and the elementary of dynamic data structures (pointers and dynamic memory allocation/de-allocation). It then presents the compound data structure including: linked lists, stacks, queues, trees data structure and binary trees. It also introduces the sorting algorithms include bubble sort, selection sort, insertion sort, mergesort, heapsort, and quicksort as well as the searching algorithms include sequential search, binary search and hashing. Finally, the course provides a comparative analysis of searching and sorting algorithms and data structures.				

Code	UR 117				
Title	**Environmental Engineering**				
Field	University Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1			3
Syllabus	On the environment and types, the definition of environmental engineer, environmental resources, noise pollution, soil pollution, radioactive pollution, solid waste management and recycling, electromagnetic waves and its health effects, health risks of mobile phone, electromagnetic radiation safety, safety standards and licensing for base stations.				

Second Semester

Code	PME 121				
Title	**Engineering Mathematics (4)**				
Field	Basic Engineering Science (Faculty/Spec. Req)				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	3	2			5
Syllabus	Multiple integrals: Double integrals – Engineering applications of double integrals – Triple integrals – Engineering applications of triple integrals – Line integral and Green's theorem – Surface integral. Vector analysis: Scalar and vector functions – Vector fields – Gradient, Divergent and Curl of vector functions and fields – Line integral and Green's theorem – Applications of integral vector functions (Stokes and Gauss theorem's). Special functions: Gamma function and its properties – Beta function and its properties Series solution of Bessel equation of first and second kind – Properties of Bessel function and its generating function – Series solution of Legendre equation – Properties of Legendre function and its generating function. Linear programming: General formulation of linear programming problem (LPP) – Matrix form of LPP – Solution of LPP using (Simplex method – Two phase simplex method) – Degeneracy and Unbounded solution of LPP – Formulation of dual LPP – Studying of some duality theorems – Solution of LPP using dual Simplex method.				

Code	ECE 122				
Title	**Semiconductor technology**				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1			3
Syllabus	Crystal Purification and Growth, Metal organic chemical vapor deposition, Chemical vapor deposition, Growth of heterojunctions Plasma depositions, Wafer Preparation, Chemical Etching, Plasma etching,Ion beam etching, Measurements of Resistivity, Drift mobility, The haynes Shockley experiment,The time of flight method, Minority carrier lifetime, Diffusion Length, Hall Effect Measurements, Constant source diffusion, Ion Implantation Doping, Photoresist Types, Film Thickness, Masks and Mask Making Electron Beam Lithography, Thin Film Deposition, Vacuum evaporation, Plating Metallization System, Surface Protection and Wafer Thinning, Dicing, Mounting and Bonding, Fabrication of Simple PN Junction, Mesa etched diodes, Planar diode for monolithic circuits, Bipolar Transistors, Junction FET,				

	The Metal Semiconductor FET, Metal Oxide Semiconductor Device, Charge Coupled Devices, Passive Circuit Elements Resistors and Capacitors, Special Device Structures, The p-n junction solar cell, Device fabrication of p-n junction solar cell, Schottky barrier solar cells Photodetectors, Light Emitting Diodes, Semiconductor Lasers.

Code	**ECE 123**				
Title	**Electronics 2**				
Field	**Specialization Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2	**1**	**1**		**4**
Syllabus	Bipolar Junction Transistor fundamentals - Bipolar Junction Transistor Characteristics - Bipolar transistor Circuits - Small Signal Bipolar Transistor Equivalent Circuit - Single Stage Bipolar Transistor Amplifier – P-N junction Field Effect Transistor – Schottky Field Effect Transistor – Insulated – gate Field Effect Transistor - Field Effect Transistor equivalent circuit and biasing circuit- SCR – UJT- multi-junction transistors.				

Code	**ACE 124**				
Title	**Electrical Power**				
Field	**Specialization Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2	**1**		**2**	**5**
Syllabus	Fundamentals of Energy and the Power System - Single- Phase Power – Three Phase Power -Power Quality and Security consideration - Transmission Line Parameters -Line Model Performance - DC Transmission and Distribution - AC Transmission and Distribution -Power flow analysis.				

Code	**ACE 125**				
Title	**Electrical Measurements**				
Field	**Specialization Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2		**1**		**3**
Syllabus	Introduction to Measurement systems – Measurement errors – Attenuators – Direct and alternating current indicating instruments – DC bridges – AC bridges – Error detection in cables - Oscilloscopes.				

Code	CSEE 126				
Title	**Computer Organization**				
Field	Computer Applications and ICT				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	2			4
Syllabus	This course covers the register transfer and micro-operations: Register transfer language, bus and memory transfers, Micro-operations: arithmetic micro-operations, logic micro-operations, shift micro-operations, hardware implementation: binary adder, binary subtractor, binary adder subtractor, incrementer, arithmetic circuit, and finally arithmetic logic shift unit. Basic computer organization and design: concepts of machine level architecture, instruction formats, addressing modes, computer instructions, instruction cycle, timing and control, memory-reference instructions, input-output reference instructions and program interrupt instructions, interrupt cycle, complete computer Syllabus. Design of basic computers: control unit Syllabus and design of control logic gates for registers, memory, common bus, AC register, Adder and logic circuit. Central Processing Unit (CPU) Design: general register organization and control word, stack organization: register stack and memory stack, Reverse Polish Notation (RPN), different of instruction formats (three, two, one and zero address instructions) and their effect on computer performance, data transfer and manipulation instructions (arithmetic, logic, shift and bit manipulation). Program control, status bit conditions, branch (conditional and unconditional, subroutine call and return, program interrupt. Micro-programmed control: control memory, address sequencing, subroutines, design of control unit, micro-program sequencer. Finally, the course presents a simple microprocessor case study.				

Code	UR 127				
Title	**Projects Management**				
Field	Humanities and Social Science				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1			3
Syllabus	Preparation of students to consider his own small business project: Introduction to entrepreneurship, Definition of different project scales, characteristics of small project, planning of small project, small project organization, small project control, performance evaluation. Application course project.				

Syllabus of Courses

Second Year

Second Year

First Semester

Code	PME 211				
Title	Engineering Mathematics (5)				
Field	Mathematics and Basic Science				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	3	2			5
Syllabus	Fourier series and Fourier transforms: Fourier series of continuous functions – Properties of Fourier series Harmonics of Fourier series – Fourier series for periodic and non-periodic functions – Fourier series for discrete functions – Differentiation and integration of Fourier series – Complex form of Fourier series – Discrete frequency spectra – Fourier integral – Fourier transform – Properties of Fourier transform – Relationship between Fourier and Laplace transforms. Transforms of step and impulse functions – Evaluation of frequency response – Engineering applications of Fourier transform. Numerical analysis: Sources and calculation of errors – Theory of approximation. Approximation of functions using polynomials – Error estimation. Approximation of functions using Interpolation (Lagrange polynomials. Error estimation for Lagrange polynomials – Newton polynomials – Error estimation for Newton polynomials) – Definition of forward operators (Δ and E) – Factorial polynomial – Difference equations – Solution methods of homogenous and non- homogenous difference equations – Numerical differentiation (Approximation derivatives using Newton interpolation polynomials – Error estimation) – Numerical integration (Newton-Cotes open and closed formulas and Gauss-Quadrature method) – Numerical solutions of ordinary differential equations using (Euler's method – Modified Euler's method and Rung-Kutta method).				

Code	ECE 212				
Title	VLSI Technology				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1			3
Syllabus	MOSFET and Fabrication Technology, The pass transistor, n-MOS, MOS Inverter and BiCMOS. Fabrication of of nMOS				

	Device/ T ransistor Fabrication of of CMOS Devices, n-Well Process, P-well Processing Steps Twin-Tub Processing. Stick diagrams. nMOS design style, CMOS-design style.Design rules and layout, Lambda-based design rules. Double metal MOS process rules, CMOS lambda-based design rules, $2\mu m$ double metal, double poly. CMOS / BiCMOS rules, Layout diagrams, Symbolic diagrams - translation to mask form. Transmission gates, Gate (restoring) logic. The inverter, Two-input nMOS, CMOS and BiCMOS Nand gates, Two-input nMOS, CMOS and BiCMOS Nor gates. Pseudo-nMOS logic, Dynamic CMOS logic, Clocked CMOS (CZMOS) logic, CMOS domino logic, n-p CMOS logic, A parity generator, Bus arbitration iogic for n-line bus. Multiplexers (data selectors), A general logic function block, A four-line Gray code to binary code converter, The programmable logic array (PLA), Two-phase clocking, Charge storage, Dynamic register element, A dynamic shift register. Illustration of the design process computational elements, Some observations on the design process, Design of a 4-bit adder, Implementing ALU functions with an adder, The Manchester carry-chain. Some CMOS design projects, CMOS project 1 - an incrementer/decrementer: MOS project 2 - left/right shift serial/para register: CMOS project 3 - a comparator for two n-bit numbers: CMOS/BiCMOS project 4 - a two-phase non-overlapping clock generator with buffered output on both phases: CMOS project 5 - design of a latch - an event-driven latch element for EDL systems.

Code	**ECE 213**				
Title	**Electrical Circuits**				
Field	**Specialization Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2	**1**			**3**
Syllabus	Introduction to DC circuit analysis and Circuit theories- A.C. fundamentals - Power analysis in A.C. circuit - Theories of AC analysis - Method of A.C. circuit solutions – Multi-frequency Drivers - Coupling circuits- Resonance circuits – Non linear circuit analysis- Two port networks- CAD for circuits .				

Code	ECE 214				
Title	**Fields and waves**				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1			3
Syllabus	Electrostatic Fields- Electric flux and gauss's law- Electrical Potential – Electric boundary conditions – Dipole moment – Capacitance- Poisson and Laplace equations – Piot & savart law- Amperes law- Vector potentials- Magnetic boundary conditions- Magnetic flux – Force and energy in magnetic field- Coils – Time varying field- Maxwell's equations- Wave propagation – Introduction to transmission line theory- Propagation in losses and loss less media- Reflection and refraction.				

Code	ACE 215				
Title	**Control Engineering**				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1			3
Syllabus	Introduction to Control Systems - Mathematical Modeling of Dynamic Systems - Reduction of Multiple subsystems (using Block Diagram and Signal Flow Graph)- Time Response Analysis - Stability Analysis – Steady-State Errors - PID Controller.				

Code	ACE 216				
Title	**Power Electronics**				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1			3
Syllabus	Introduction to power electronics – Types of power electronic circuits – Power semiconductor devices, construction, operation, ratings, how to choose it, and circuits application: (SCR – Triac – Gto - UJT – PUT - Diac) Triggering circuits for thyristor, resistance trigger circuit – RC trigger circuits – UJT for trigger circuit – Diac and PUT to provide a pulse to trigger thyristor – Design of firing circuit – synchronizing a UJT pulse with AC line voltage – Switching off circuits and protection – switched DC source with different load circuits – Recovery of trapped energy – single phase half wave rectifier with different load circuits and with electromotive force (emf) – RL load circuit with free				

	wheeling diode – Single phase and three phase controlled rectifiers with different load circuits and emf – Heat sinks specification – Commutation circuits.

Code	**CSE 217**				
Title	**Microprocessors and Applications**				
Field	**Computer Applications and ICT**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2		**2**		**4**
Syllabus	Microprocessor architecture: Processor architectures [Intel 8086 to Pentium], addressing modes, memory interfacing, and address space, detailed architecture of Intel Microprocessors. Instruction set: Different types of instructions, instruction cycle, timing diagram, generating control signals. Interfacing Input and output devices: Detailed pin diagrams. Execution of In and OUT instructions and their timing diagram, memory mapped I/O Vs I/O mapped I/O. Keyboard interfacing and scanning, digital to analog converters and analog to digital converters interfacing and operation. Interrupts: Basic concept of interrupts, different interrupts signals used in Intel microprocessors. Detailed discussion about different types of interrupts and interrupt controller.				

Second Semester

Code	PME 221				
Title	**Engineering Mathematics (6)**				
Field	Mathematics and Basic Science				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	3	2			5
Syllabus	Functions of complex variables: Definitions of the functions of complex variables – Limits and continuity of the functions of complex variables – Harmonics and complex conjugate functions of complex variables – Differentiation and Integration of the functions of complex variables – Different Mappings of the functions of complex variables. Power series of the functions of complex variables – Singularities, zeros and residues – The residue theorem – Contour integration of the functions of complex variables – Engineering applications. Z-Transform: Definition of the Z-transform – Properties of the Z-transform – The inverse Z-transform – Discrete linear systems – Z-transfer functions – The impulse response – The relationship between Laplace and Z-transforms. Engineering applications – Discrete-time systems and difference equations. The solutions of difference equations using Z-transforms and inverse of Z-transforms. Applied statistics and probability: Rules of probability – random variables – continuous and discrete probability distribution functions – mathematical expectation and moment generating functions of random variables – joint distribution of several random variables – covariance and correlation – engineering applications.				

Code	ECE 222				
Title	**Communication Engineering**				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1			3
Syllabus	Introduction in Communication Systems- Energy spectral density analysis – Amplitude modulation suppressed carrier and its de-modulation - Amplitude modulation with carrier its de-modulation – Single side band suppressed carrier its de-modulation - Vestigial side band its de-modulation – Narrow band frequency modulation and demodulation- wide-band frequency modulation and demodulation- Phase modulation- Frequency and amplitude modulation receiving systems- Frequency division multiplexing- Noise in analog modulation systems.				

Code	ECE 223				
Title	**Electronic Circuits**				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1		2	5
Syllabus	Multi stages amplifier – Feed back amplifier- oscillators – Power amplifier- High frequency amplifiers - Integrated Circuits amplifier – Wide band amplifier- Operational Amplifiers characteristics- Wave generation and shaping- Application of non-linear circuits- Design of analog electronic circuits- Circuit simulation- Response Syllabus and printed circuit building.				

Code	ACE 224				
Title	**Electrical Machines**				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1			3
Syllabus	Transformers - DC generator - DC motor - Speed control of DC motor - Single phase induction motor - Single phase synchronous motor - Single phase generator - Three phase machines - Special type's machines.				

Code	ACE 225				
Title	**Microcontrollers**				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1	1		4
Syllabus	Introduction to Microcontrollers - Microcontrollers versus microprocessors - Logic design - Microprocessor architecture (RISK, CISC) - Memory unit - Central Processing Unit – Bus system - Input-output unit (Ports operation Pin operation) - Serial communication interface - Timer unit – Watchdog - Interrupts - Analog to Digital Converter - Programming (assembly language, Basic language, C language) -microcontroller interfacing circuits – Case study and applications.				

Code	CSE 226				
Title	**Database Systems**				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2		2		4
Syllabus	Importance of information bases in organizations- Concept of data & Overview of DBMS, Data Models, Database Languages, Database Administrator, Database Users, Three Schema architecture of DBMS.- Entity-Relationship Model ,Basic concepts, Design Issues, Mapping Constraints, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended, E-R features.- Relational Model ,Structure of relational -Databases, Relational Algebra and calculus- SQL queries and Integrity Constraints.				

Code	UR 227				
Title	**Report Writing**				
Field	Humanities and Social Science				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	2			4
Syllabus	Development of oral proficiency and writing skills through communication groups and free- writing exercises. Expression forms, figures, tables and equations. Texts. Scientific reports. Thesis. Presentations. Audio-visual aids. Oral presentations. Curriculum Vitae. Word processing.				

Syllabus of Courses

Department:

Electronics and Electrical Communication Engineering

Third Year

Third Year

First Semester

Code	ECE 311				
Title	**Digital Communication**				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1	1		4
Syllabus	Introduction-The Sampling theory - Digital Transmission systems- Digital Modulation systems - Data Communication systems – Data acquisition- Performance of digital communication systems in the presence of noise. Advanced topics in digital communication- Intersymbol interference- In band limited channels- Channel characteristics- Equalization- Multi-carrier modulation- Discrete multi-tone system- Matched filtering- Coherent receiver- spread spectrum principles.				

Code	ECE 312				
Title	**Electromagnetic waves**				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1	1		4
Syllabus	Vector calculus, Maxwell's equations, Waves in general, Plane waves in lossless dielectrics, Wave propagation in lossy dielectrics, Plane waves in conductive materials, Applications, Power and the Pointing vector, Reflection of a plane wave at normal incidence, Reflection of a plane wave at oblique incidence, Applications, Transmission line equations, Input impedance, Standing wave ratio, Lossless and low-loss propagation, Power transmission and loss characterization, Rectangular waveguides, Circular waveguides, TM modes, TE modes, Wave propagation in the waveguide, Power transmission and attenuation, Waveguide resonators- Microstrip lines.				

Code	ECE 313				
Title	**Acoustics and Ultrasonic**				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1			3
Syllabus	Vibrations and Waves-The Acoustic Wave Equations-Transmission Phenomena-Radiation and Reception of Acoustic Waves- Acoustic theories for long enclosure- Reverberation-Design of long enclosures- Acoustic design of urban streets-Acoustic design based on scale modeling- Ultrasonic Transducers-Loudspeakers-Microphones-Room Acoustics- Underwater Acoustics.				

Code	ECE 314				
Title	**Network Theory**				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1			3
Syllabus	Revision of two port networks- Z-parameters-Y-parameters-ABCD parameters- S-parameters- Basic filter theory- Synthesis of one port and two port networks- Prototype and m-derived filters-Filter approximations-Butterworth filter- Chebychev filter-Elliptic filter- Bessel filter- Active filter design- Switched capacitor filter design-Analog phase locked loop analysis and design.				

Code	ECE 315				
Title	**Elective Course (1)**				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1			3
Syllabus	**A1. Mechatronics Engineering** Lagrangian dynamics of mechanical systems- Dynamics of electrical networks- Electromechanical Systems- Constitutive relations for transducers- Hamilton's Principle- Lagrange's equations- General electromechanical transducer-Piezoelectric Systems- Piezoelectric transducer-Constitutive relations of a discrete transducer-Structure with a discrete piezoelectric transducer-Multiple transducer systems-General piezoelectric structure- Piezoelectric material- Rosen's piezoelectric transformer-Piezoelectric laminates-Piezoelectric beam actuator-				

	Laminar sensor-Spatial modal filters-Active beam with collocated actuator-sensor -Piezoelectric laminates-Active and Passive Damping with Piezoelectric Transducers-Active strut-open-loop FRF-Active damping-Admittance of the piezoelectric transducer-Damping via resistive shunting-Inductive shunting-Decentralized control-General piezoelectric structure-Self-sensing-Other active damping strategies. **B1. Digital Exchanges** Historic perspective- Numbering plan- Manual service exchanges-Pre-digital automatic exchanges- Electromechanical signaling-Private Branch Exchanges-Dual Tone multi frequency system and signal processing- Electronic switches- Switching matrices-Switch control algorithms- Routing algorithms- Telephone set components- DSL services- Adaptive echo cancellation-DSLAM- ISDN system- Internet exchanges- The VoIP system-Fiber telephone systems- Fault diagnosis and tolerance. **C1. Random Variables and random processes** Probability theory: Conditional Probability (Discrete/ Continuous) - Distributions (Continuous / Discrete) – Density/ Distribution functions - Moments generating function – Permutations – Combinations - Random Variables (Continuous / Discrete) –Sums of Random Variables – Random variable distributions- Gaussian random variables- Rayleigh random variables- Rician random variables- Bernoulli random variables- Nakagami random varaiables- Hypothesis tests- Random process- autocorrelation-cross correlation-power spectrum- cross spectrum- Fuzzy sets-Fuzzy random variables.

Code	**ECE 316**				
Title	**Elective Course (2)**				
Field	**Specialization Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2	**1**			**3**
Syllabus	**D1. Digital Image processing** Fundamentals of image processing- Image enhancement- Image restoration- Image compression- Image segmentation- Image classification- Image watermarking and encryption- Biomedical image processing- Remote sensing image processing- Video processing- Image communication- Image retrieval from databases.				

	E1. Surface Acoustic Wave Devices Fundamentals of surface acoustic waves and devices-Basics of piezoelectricity and acoustic waves- Linear phase SAW filter design- Equivalent circuits and analytic models for SAW filters- Second order effects in SAW filters- SAW transducers and their design- SAW reflection gratings and resonators- SAW filters for mobile communication- SAW components for CDMA systems- SAW components and frequency synthesizers- SAW components for optical, microwave, and satellite systems. **F1. Electromagnetic Compatibility** Introduction to Electromagnetic Compatibility (EMC)-EMC Requirements for Electronic Systems- Signal Spectra-The Relationship Between the Domain and the Frequency Domain-Transmission Lines and Signal Integrity- Nonideal Behavior of Components-Conducted Emissions and Susceptibility- Radiated Emissions and Susceptibility-Crosstalk-Shielding- System Design for EMC.

Code	**UR 317**				
Title	**Professional ethics and quality of the product**				
Field	**University Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2	**1**			**3**
Syllabus	General ethics for the engineer, Decision analysis, Linear Programming, New trends for both quality adjustment and improving and their applications in both industry and industrial services, The general framework for the operation of quality systems with a focus on quantitative techniques to adopt the quality, The use of computer software tools to assure the quality targets				

Second Semester

Code	ECE 321				
Title	**Communication Circuits**				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1			3
Syllabus	Automatic gain control circuit, Automatic gain control system, Theory of automatic gain control, Linear automatic gain control, Automatic gain control system components, Phase stability of the oscillator, Parallel load crystal oscillator, Voltage controlled oscillator, Oscillator controlled using SAW delay lines, Digital phase locked loop theory, Phase comparator, Linear model phase locked loop, Digital phase detector, Flip-flop phase detector, Phase frequency detector, Digital phase locked loop, Direct frequency synthesis, Indirect frequency synthesis, Variable module divider, Down converter, Fractional-N loop, Direct digital synthesis, Phase noise- Satellite transponder circuits- TV circuits- exchange circuits- synchronization circuits- Digital modulation circuits- Mixer circuits.				

Code	ECE 322				
Title	**Digital Signal Processing**				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2		1		3
Syllabus	Linear Systems, Convolution, Discrete time signals and Systems, The Discrete Fourier Transform, Applications of the DFT, The Fast Fourier Transform, Digital Filters Design, Realization of Digital Filter, Moving Average Filters, Windowed-Sinc Filters, Custom Filters, Recursive Filters , Multi-rate signal processing, wavelet theory and applications, Adaptive filter theory, Kalman filters, Lattice filters, Linear Spectral Estimation, Nonlinear spectral estimation, Higher order statistics.				

Code	ECE 323				
Title	**Microwave Engineering**				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1	1		4
Syllabus	Circuit Theory for Waveguide System, Impedance matching and tuning, Microwave resonators, Power dividers and directional				

	couplers, Filter Design, Theory and design of ferromagnetic materials, Magnetic resonance and applications.

Code	**ECE 324**				
Title	**Mobile Communication Systems**				
Field	**Specialization Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2		**1**		**3**
Syllabus	Fundamentals of Mobile Radio –(Cellular Structure- Mobile Radio Network Structure- Channel Allocation Techniques) -Mobile Radio Propagation Channel characteristics - Diversity and Combining Techniques - System Capacity Analysis -Digital Cellular Mobile Radio system -Modulation Techniques- Multiple Access Techniques -Operating Systems-3rd Generation Systems -Wimax system structure- OFDM modulation technique- MC-CDMA system- SC-FDMA system.				

Code	**ECE 325**				
Title	**Optoelectronics**				
Field	**Specialization Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2	**1**			**3**
Syllabus	Introduction – optical fiber wave guides. – Transmission characteristics of optical fiber wave guide - fabrication of optical fibers-optical sources –Laser diodes- Light emitting diodes- optical power launching and coupling, p-i-n photodetector- Avalanche photodetector-laser systems- Integrated optics systems.				

Code	**ECE 326**				
Title	**Elective Course (3)**				
Field	**Specialization Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2	**1**			**3**
Syllabus	**A2. Neural Networks** Neural Networks Basics - Mathematical models of Neural Networks - Neural Networks Topologies – Supervised learning- Unsupervised learning- Feature Extraction Methods - Feature				

	selection Methods - Feature combination Methods - Learning and Training Algorithms - Momentum and Decreasing Errors - Over-Fitting and Cross-Verification Algorithms - Recall and Performance Estimation - Validation and Testing Algorithms - Neural Networks Implementation- Multilayer perceptrons- Genetic algorithms- Neural networks in microwave modeling- neural networks in communications- Neural networks in antennas- Support vector machines and applications. **B2. Information Security Systems** Principles of security- Cryptography algorithms- Data encryption standard- Advanced encryption standard- RC6- Digital signature- Hashing- Chaotic maps- Wireless Network security- Optical network security- Hacking- Verology- Intrusion detection. **C2. Modeling and Simulation** Model definition- 1.3 Performance Evaluation Techniques- Development of Systems Simulation- Designing and Implementing a Discrete-Event Simulation Framework- Monte Carlo Simulation- Network Modeling-The Network Modeling and Simulation Process-Network Simulation Packages- OPNET- Designing and Implementing CASiNO: A Network Simulation Framework-Statistical Distributions and Random Number Generation-Queuing Theory- Input Modeling and Output Analysis- Modeling Network Traffic- Optimization techniques- particle swarm optimization- genetic algorithms.

Code	**ECE 327**				
Title	**Elective Course (4)**				
Field	**Specialization Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2	**1**			**3**
Syllabus	**D2. Speech processing** Characteristics of speech signals- Speech coding- Speech analysis- Speech enhancement- Speech synthesis- speaker identification- Speech recognition- Speaker identification- Emotional speech processing- Speech encryption- Applications for speech processing.				

	E2. Superconducting Circuits Characteristics of superconductors- AC properties and superconducting energy gap- Magnetic properties of superconductors- Superconducting materials and thin film technology- Josephson devices- Superconducting digital circuits- Superconducting radiation detectors- superconducting microwave circuits. **F2. Biomedical Imaging** Ultrasonic imaging system- Magnetic resonance imaging system- X-Ray imaging system- CT imaging system- Infrared imaging system- PET imaging system- Confocal microscopy imaging for the eye- Retinal and corneal imaging- Processing of medical images- Digital holography- Spectroscopy- Superresolution reconstruction of medical images – Medical image fusion- Medical image enhancement- Medical image interpolation.

Syllabus of Courses

Department:

Electronics and Electrical Communication Engineering

Fourth Year

Fourth Year

First Semester

Code	ECE 411				
Title	**Antenna Engineering**				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2		1		3
Syllabus	Fundamental parameters of an antennas-Linear wire antennas-Loop antennas-Helical antennas-Arrays (linear, planner and circular)- Traveling and broadband antennas- Reflectors antennas (plane, corner and parabolic reflector)- Aperture antennas, slot antennas and horn antennas- Mircostrip antennas- Dielectric resonator antennas- Numerical technique used for solving an antennas problems- Ground wave Propagation-Space wave Propagation-Sky wave Propagation- Introduction to RF stealth systems, imperceptibility parameters, intercept receivers, stealth waveforms, stealth antennas.				

Code	ECE 412				
Title	**Microwave Electronics.**				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1			3
Syllabus	Microwave Tubes- MESFET- HEMT- small signal modeling – large signal modeling-Solid State Amplifiers-Parametric Amplifiers-Oscillators and Mixers – Microwave oscillators-Detectors and mixers- Frequency multipliers and dividers- MEMs devices- Microwave circuit fabrication- Network analyzer operation principles- source and detector measurements technology- CAD techniques for device modeling.				

Code	ECE 413				
Title	**Information Theory and Coding**				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1			3
Syllabus	Mathematical analysis of discrete and continuous information sources and communication channels. Concepts of mutual				

	information and entropy as mathematical measures for sources and channels- Rate distortion theory- Gambling and data compression- Kolomogorov complexity- Hidden Markov models- Channel capacity, source and channel coding theorems- Hamming codes- RS codes- BCH codes- LDPC codes- Turbo codes- Rateless codes- Data Encryption- DES- AES – RC6.

Code	**ECE 414**				
Title	**Computer Networks**				
Field	**Specialization Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2		**1**		**3**
Syllabus	Uses of Computer Networks-Network Hardware- Network Software- Reference Models- Example Networks-Network Standardization- Metric Units- The Physical Layer- The Theoretical Basis for Data Communication- Guided Transmission Media- Wireless Transmission- Communication Satellites- The Public Switched Telephone Network- The Mobile Telephone System- Cable Television- The Data Link Layer- Data Link Layer Design Issues- Error Detection and Correction- Elementary Data Link Protocols- Sliding Window Protocols- Protocol Verification- The Medium Access Control Sublayer- The Channel Allocation Problem- Multiple Access Protocols- Ethernet- Wireless LANs- Broadband Wireless- Bluetooth- Data Link Layer Switching- The Network Layer- Network Layer Design Issues- Routing Algorithms- Congestion Control Algorithms- Quality of Service- Internetworking- The Network Layer in the Internet- The Transport Layer- The Transport Services- Elements of Transport Protocols- The Internet Transport Protocols: UDP- The Internet Transport Protocols: TCP- The Application Layer- DNS—The Domain Name System- Electronic Mail- The World Wide Web- Multimedia- Network Security- Cryptography- Symmetric-Key Algorithms- Public-Key Algorithms- Digital Signatures- Management of Public Keys- Communication Security- Authentication Protocols- E-Mail Security- Web Security.				

Code	**ECE 415**				
Title	**Optical Communications**				
Field	**Specialization Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2		**1**		**3**
Syllabus	Mathematical analysis of discrete and continuous information sources and communication channels. Concepts of mutual				

	information and entropy as mathematical measures for sources and channels -Channel capacity, Line coding, source coding and channel coding (binary and non-binary)- Data Encryption- DES-AES – RC6.

Code	**ECE 416**				
Title	**Elective Course (5)**				
Field	**Specialization Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2	**1**			**3**
Syllabus	**A3. Integrated Circuit Design** Integrated circuit devices and modeling- Spice modeling- CMOS processing and layout- Current mirrors and single stage amplifiers- Design of Op-Amp- Comparator design- Sample and hold- voltage reference and translinear circuits- Switched capacitor circuits- Sample rate conversion circuits- integrated phase locked loops- microwave integrated circuits- Digital integrated circuit design- CAD tools for circuit design. **B3. Sensor Networks** Principles of sensor networks- Motivation for a Network of Wireless Sensor Nodes- Types of sensor networks- sensor network structure- Operating systems-Planning of sensor networks- sensor network protocols and layers- Power management- Time synchronization- signal processing techniques in sensor networks- Applications of sensor networks- Sensor networks security- Localization- Programming. **C3. Broadcasting and television Engineering** Radio Transmission Systems -Radio Broadcast Systems -Radio STL Systems -Digital Radio Systems -Television Transmission Systems -Television Transmission Standards -DTV Transmission Issues -DTV Satellite Transmission -Television Transmitters -Ghost Canceling Reference Signal -Interconnection Devices and Systems -Transmission Lines -RF Combiner and Diplexer Systems -Transmitting Antennas and Systems -Radio Transmitting Antennas Television Antenna Principles -Television Transmitting Antennas -Tower Construction and Maintenance -Tower Grounding -Radio Receivers -Receiver Characteristics -The Radio Channel AM and FM Receivers -Television Receivers & Cable/Satellite Distribution Systems -Television Reception				

	Principles -ATSC DTV Receiver Systems -Consumer Video and Networking Issues -Cable Television Systems -Satellite Delivery Systems -Content Distribution -Stereo Television -Receiver Antenna Systems -Adaptive Receiver Processing -RF System Maintenance -RF System Reliability Considerations -Preventing RF System Failures Troubleshooting RF Equipment -Standby Power Systems -Test Equipment - Troubleshooting Digital Systems -Digital Test Instruments - Audio Test & Measurement - Audio Measurement & Analysis - Audio Phase and Frequency Measurement - Nonlinear Audio Distortion Time Domain Audio Measurements -Video Signal Measurement and Analysis -Video Information Concepts - Measurement of Color Displays - Camera Performance Verification Conventional Video Measurements - Applications of the Zone Plate Signal Picture Quality Measurement - Digital Bit Stream Analysis - DTV Transmission Performance Issues.

Code	**ECE 417**				
Title	**Graduation Project**				
Field	**Projects and practice**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	1			**3**	**4**
Syllabus	A major independent project under the supervision of a staff member; to enable the student to understand and apply the knowledge gained throughout his coursework to an engineering problem at large scale- at the end of the project, the student should submit a report.				

Second Semester

Code	ECE 421				
Title	**Satellite Engineering**				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2		1		3
Syllabus	Historical Background and Evolution of satellite Technology- Satellite Network-Different types of systems- Satellite services - Basic characteristics of satellite telecommunications- Regulatory considerations and system planning- Characteristics of a satellite link - Quality of service and availability - Link calculations - Earth coverage and frequency reuse - Orbit/spectrum utilization - Time Division Multiple Access - Demand Assignment (DAMA)- Network architectures - communication satellites - Space segment- Satellite orbits- Satellite ground track and coverage - General Syllabus of communication satellites- The communication payload - Intersatellite links (ISL)- Special features of non-GSO (NGSO) satellite systems- Launching, positioning and station-keeping- Reliability and availability considerations- Management of satellite communication network operations- Satellite launch systems- Configuration and general characteristics of earth stations- Low noise amplifiers- power amplifiers and its Non-linearity effects - DAMA implementation- Monitoring, alarm and control- General construction of main earth stations- Earth stations for direct reception of TV and audio programs - Interconnection of satellite networks with terrestrial networks and user Terminals- Interconnection of telephony networks- General considerations on protocols and terrestrial interfaces- Interconnection with user data terminating equipments- Interconnection with data networks- Interconnection with ISDN- Interconnection with ATM networks- Interconnection of television networks, television distribution- Frequency sharing, interference and coordination- Radio Regulations provisions and ITU-R procedures- Frequency sharing between GSO FSS networks - Frequency sharing between the GSO FSS networks and other space services- Frequency sharing between the GSO and non-GSO FSS and other GSO and non-GSO space services (except the GSO/GSO case)- Frequency sharing between the FSS networks and other radio services in bands also allocated to the FSS- Inter-satellite service (ISS) - Frequency sharing between systems of the GSO and non-GSO FSS and the terrestrial services.				

Code	ECE 422				
Title	**Radar systems**				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2		1		3
Syllabus	Radar Systems, General properties of radar systems, Pulse radar				

	Block diagram of a radar, Components of the radar system, Signal detection, Radar resolution, Radar signals and signal processing, Radar power budget analysis, Target tracking, Radar antennas, Synthetic aperture radar, Interference protection, Doppler radar, Synthetic aperture radar system and image processing, Ground penetrating radar, signal processing for ground penetrating radar.

Code	**ECE 423**				
Title	**Advanced Communication Systems**				
Field	**Specialization Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2	**1**			**3**
Syllabus	Acoustic communication systems- ad hoc networks- Speech communication systems- Cooperative communications- cognitive radio- MIMO systems- Continuous phase modulation systems- Virtual LANs- Radio Frequency identification system- Global positioning system- Wireless location determination- Advanced encryption schemes- Dirty paper coding in communication systems- Blind multiuser detection systems- Space-time multiuser detection- Narrowband interference cancellation- Anti-jamming techniques- Coded multicarrier modulation systems- Multimedia communication over wireless networks- Femtocell networks.				

Code	**ECE 424**				
Title	**Network Planning**				
Field	**Specialization Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2	**1**			**3**
Syllabus	Goal of Network Planning-Fundamental Plans-Financial Plan-Provision Timing Plan-Technical Plan -Forecasting Plan -Switching Plan -Numbering Plan -Routing Plan-Signaling Plan -Charging Plan-Evaluation and Development Plan -Transmission plan -Quality of Service -Grade of Service-Mobile Radio Network- Satellite Network.				

Code	**UR 425**				
Title	**Engineering Economics and Legislations**				
Field	**University Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2	**1**			**2**
Syllabus	**The organizing laws of work- the public work sector laws.**				

<table>
<tr><td>Code</td><td colspan="5">ECE 426</td></tr>
<tr><td>Title</td><td colspan="5">Elective Course (6)</td></tr>
<tr><td>Field</td><td colspan="5">Specialization Requirements</td></tr>
<tr><td rowspan="2">Hours</td><td>Lecture</td><td>Tutorial</td><td>Lab.</td><td>Practical</td><td>Total</td></tr>
<tr><td>2</td><td>1</td><td></td><td></td><td>3</td></tr>
<tr><td>Syllabus</td><td colspan="5">

D3. Pattern Recognition

Introduction- Polynomial Curve Fitting- Probability Theory- Model Selection- Decision Theory- Probability Distributions- Linear Models for Regression- Linear Models for Classification - Neural Networks- Support vector machines- Genetic algorithms- Kernel Methods- Sparse Kernel Machines- Graphical Models - Mixture Models and EM - Approximate Inference - Sampling Methods- Sequential Data - Combining Models- Applications for face iris and fingerprint recognition.

E3. Nano Devices

Introduction.- Microscopic Classical Theory.- Quantum Theory with Classical Fields.- Quantum Electrodynamic Theory- Nanophotonics- Dressed photon technology for qualitatively innovative optical devices, fabrication, and systems- DNA process for quantum dot chain- Photon enhanced emission microscopy.- Nearfield spectroscopy of metallic nanostructure.- Self-organized fabrication of composite semiconductor quantum dots- Metallic nanostructure- Nanophotonic information systems with security – Single electron transistor- Nano-optics- Nano antennas- Nano acoustics- CAD techniques for nano devices design.

F3. Numerical Methods in Electromagnetic

Fundamental Concepts - Review of Electromagnetic Theory- Classification of EM Problems - **Analytical Methods** - Separation of Variables - Separation of Variables in Rectangular Coordinates- Separation of Variables in Cylindrical Coordinates -Separation of Variables in Spherical Coordinates - Some Useful Orthogonal Functions - Series Expansion - Lab./Practical Applications - **Finite Difference Methods** - Finite Difference Schemes - Finite Differencing of Parabolic PDEs - Finite Differencing of Hyperbolic PDEs - Finite Differencing of Elliptic PDEs - Accuracy and Stability of FD Solutions - Guided Structures - Wave Scattering (FDTD) - Absorbing Boundary Conditions for FDTD - Finite Differencing for Nonrectangular Systems - Numerical Integration - **Variational Methods** - Operators in Linear Spaces - Calculus of Variations - Construction of Functionals from PDEs - Rayleigh–Ritz Method - Weighted

</td></tr>
</table>

	Residual Method - Eigenvalue Problems - Lab./Practical Applications - **Moment Methods** - Integral Equations - Green's Functions - Quasi-Static Problems - Scattering Problems - Radiation Problems - EM Absorption in the Human Body - **Finite Element Method-** Solution of Laplace's Equation- Solution of Poisson's Equation - Solution of the Wave Equation - Automatic Mesh Generation I — Rectangular Domains Automatic Mesh Generation II — Arbitrary Domains - Bandwidth Reduction - Higher Order Elements - Three-Dimensional Elements - Finite Element Methods for Exterior Problems - Finite-Element Time-Domain Method - **Transmission-line-matrix Method** - Transmission-line Equations - Solution of Diffusion Equation - Solution of Wave Equations - Inhomogeneous and Lossy Media in TLM - Three-Dimensional TLM Mesh - Error Sources and Correction - Absorbing Boundary Conditions - **Monte Carlo Methods** - Generation of Random Numbers and Variables - Evaluation of Error - Numerical Integration - Solution of Potential Problems - Regional Monte Carlo Methods - Time-Dependent Problems - **Method of Lines** - Solution of Laplace's Equation - Solution of Wave Equation - Time-Domain Solution – Matlab examples.

Code	**ECE 427**				
Title	**Graduation Project**				
Field	**Specialization Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	1			**3**	**4**
Syllabus	A major independent project under the supervision of a staff member; to enable the student to understand and apply the knowledge gained throughout his coursework to an engineering problem at large scale- at the end of the project, the student should submit a report.				

Syllabus of Courses

Department:
Industrial Electronics and Control Engineering

Third Year

Third Year

First Semester

Code	ACE 311				
Title	Electronic Measurements				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1			3
Syllabus	Introduction and Review - Digital instrumentation - indicators and recorders - harmonic and logic analyzers - Analog to digital and digital to analog converters - Transducers and signal conditioning - chemical measurements.				

Code	ACE 312				
Title	Linear Control Systems				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1			3
Syllabus	Frequency response techniques (bode diagram, Nyquist criteria) - Stability via the bode plots - Stability via the Nyquist diagram - Analyzing system's transient and steady state error performance using Frequency response techniques -Controller and compensator design based on frequency response techniques - Frequency response based Lab./Practical application analysis and design - Root Locus techniques - Root Locus based analysis and design - State space modeling -State space representation of electrical systems i.e. electrical networks - State space representation of mechanical systems - State space representation of electromechanical systems - Conversion between transfer function and state space modeling - State space representation of nonlinear systems -Linearization of the state space model representation of nonlinear systems - Stability via state space modeling -Design via state space modeling.				

Code	ACE 313				
Title	Micro-Controllers Applications				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2		2		4
Syllabus	C programming language - Functions and libraries in mikroc - simple pic16 projects - Interrupt and timers - Advanced pic16 and				

	pic18 projects - Analog to digital converter (ADC) program - Liquid crystal display (LCD) program - keypad program - pulse width modulation - (PWM) program - serial communication - (USART) program - Software UART program - EEPROM program - Speed control on a DC motor - Room temperature control – calculator - Voltmeter.

Code	**ACE 314**				
Title	**Biomedical Electronics**				
Field	**Specialization Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2	**1**	**1**		**4**
Syllabus	Basic concepts of biomedical electronics and instrumentations – Basic sensors and principles – Amplifiers and signal processing – the origin of biopotential – Biopotential electrodes – Biopotential amplifiers – Applications of electronics in medical.				

Code	**ACE 315**				
Title	**Control Systems Applications -1**				
Field	**Specialization Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	1		**2**		**3**
Syllabus	Control of Servo motors - Process control applications – Machine applications.				

Code	**ACE 316**				
Title	**Elective -1**				
Field	**Specialization Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2	**1**			**3**
Syllabus	**A1-Advanced control systems -1** Modern control theory - Controller design based on state space approaches - Observer design**.**				

	B1- Mechatronic-1 Introduction (Buses system, RISC-CISC processors, design principles for modern computers) - Computer Memory - Computer Buses - Computer Peripherals - Magnetic amplifier – Potentiometers -Mechanical differential - DC Motors/ Generators – sensors -switches and relays - motor drives. **C1- Medical - 1** An introduction to the human body anatomy and physiology – the anatomy and physiology of (human Cell - nervous system – muscles - cardiovascular systems - respiratory system - digestive system - urinary system - endocrine system). Pre-requisite: Human Anatomy**.**

Code	**UR 317**				
Title	**Professional Ethics and Quality of products**				
Field	**University Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2	**1**			**3**
Syllabus	General ethics for the engineer, Decision analysis, Linear Programming, New trends for both quality adjustment and improving and their applications in both industry and industrial services, The general framework for the operation of quality systems with a focus on quantitative techniques to adopt the quality, The use of computer software tools to assure the quality targets				

Second Semester

Code	ACE 321				
Title	Nonlinear Control Systems				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1			3
Syllabus	Introduction to nonlinear control systems - Analysis of nonlinear control - Describing function analysis – Phase plane analysis - Liapunov stability analysis for linear and nonlinear systems –Lure type Liapunov function and estimate the region of attraction of NL systems - Nonlinear sampled data control systems.				

Code	ACE 322				
Title	Robotics				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1			3
Syllabus	Introduction to robots – Study of Syllabuss, transformations, and orientations – Manipulator kinematics – Inverse manipulator kinematics – Velocities – Static forces – manipulator dynamics – Trajectory generation – position control of manipulators – Force control of manipulators – Hybrid position-force control scheme – robot programming languages – Industrial applications.				

Code	ACE 323				
Title	Digital Control Systems				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	2			4
Syllabus	Signal analysis - Sampling theorem - Transfer function block diagram – Stability - Digital P controller design - Digital PI controller design - Digital PD controller design - Digital PID controller design - Design a pole placement controller - System identification (Least square method) - System identification (Recursive least square method) - Design a self tuning controller - Adaptive controller (Minimum variance regulator) - Adaptive controller (Generalized minimum variance controller) – Applications.				

Code	ACE 324				
Title	Industrial Electronics				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1			3
Syllabus	Overview of SCRs, triacs and transistors in industrial applications – Cooling and protection of power semiconductor devices – AC voltage controllers (on – off control – phase control) with single phase and three phase controllers – Single phase transformer tap changer – cycloconverters – Drive systems, single and three phase dc motor drive systems – Controlled poly phase (ac - dc) converters – Wending with solid state circuits – Final correcting devices, valves – Relays and contactors – DC servo motor – DC-to-DC converters (choppers) – Inverter circuits – Applications.				

Code	ACE 325				
Title	Control systems Applications -2				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	1		2		3
Syllabus	Introduction to programmable controllers (Conceptual design of the PLC & Principles of operation) - PLC Hardware (Processor - Power supply - Memory organization) - Programming devices - PLC programming Language (Ladder diagram)- Lab./Practical Applications.				

Code	ACE 326				
Title	Elective -2				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1			3
Syllabus	**A2-Advanced control systems-2** Introduction to optimal control - Optimal control types - Optimal control design. **B2-Mechatronic-2** Motor Control - Systems Biology – Bioinformatics - Signal Processing - Image Processing - Machine Vision - Evolutionary Computing (GA, PSO) - Power Systems: Analysis, Modeling, and Control - Modern Control Theory - Robust and Optimal Control - CNC Machines - Embedded Systems Design -				

	Renewable Energy Conversion Systems - Hydraulic Systems: Analysis, Modeling, and Control -Machine Learning . **C2-Medical-2** Boimaterials (major consideration for biomaterials, biocompatibility and examples of applications – Structure of solids – types of bonds – crystalline and non crystalline materials, crystal structure of solids and defects in crystals – Structure property relationships of biomedical materials – host reaction to biomaterials, biocompatibility and blood compatibility – Soft tissue and hard tissue replacement implants – Major types of implant materials: metals, polymers, ceramics and composites)

Code	**ACE 327**				
Title	**Elective -3**				
Field	**Specialization Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2	**1**			**3**
Syllabus	**A3-Advanced Computing-1** Introduction to FPGA (Brief History of Programmable Logic Devices - Structure of CPLDs - Structures of FPGAs) – FPGA - System Design with FPGAs - Signal Processing Using FPGA - Applications of FPGA. Design Using VHDL (Introduction to VHDL - VHDL Code Structure - Data Types - Operators and Attributes - Concurrent VHDL Codes - Sequential VHDL Codes - Signals and Variables - State Machines) - Simulation and Implementation Using EDA Tools with Examples. Building VHDL Codes for Microprocessors. **B3-Communication system in process control** Introduction to process control in industrial - Communication system importance in industrial - Networking in industrial - Communication system classification - Industrial communication protocol. **C3-Computer network** Introduction to computer network - Computer network fundamental - Types of computer network - Computer network requirements - Computer network protocol.				

Syllabus of Courses

Department:
Industrial Electronics and Control Engineering

Fourth Year

Fourth Year

First Semester

Code	ACE 411				
Title	Programmable Logic Controllers				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2		2		4
Syllabus	The Analog Input/Output System - Special Function I/O - GRFCET Programming - Local Area Networks - Serial Communications - I/O Bus Networks - PLC Maintenance - System Selection Guidelines - Application Examples.				

Code	ACE 412				
Title	Real Time Control Systems				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	2			4
Syllabus	Introduction to Real Time Systems - Types of real time systems - Computer concepts for industrial process - Real time control system requirements - Sequential and supervisory control -Soft ware requirements - Real time operating systems - Embedded real time operating system - Hardware requirements – Interfacing - Direct digital control systems - Application of DDC in real time - Algorithm realization - Designing real time control systems - Applications.				

Code	ACE 413				
Title	Medical Instrumentations				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1	1		4
Syllabus	Cardiac system and circuits – Blood pressure and sounds – measurements of flow and volume of blood – Measurements of respiratory system- Clinical laboratory instrumentation – Medical imaging systems – therapeutic and prosthetic devices – Electrical safety.				

Code	ACE 414				
Title	Control systems Applications -3				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	1		2		3
Syllabus	Process control experiments (Level control - Flow control - Pressure control) – Mechatronics (Elevator system - Industrial sensors – Robotics) - Power electronics (Firing circuits for SCR and Triac - Voltage controller – Inverter - Chopper circuit - DC-machine control - Asynchronous machine) - Stepper motor control.				

Code	ACE 415				
Title	Elective -4				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1			3
Syllabus	**A4-Advanced control systems-3** Introduction to intelligent control - Types of intelligent controller - Intelligent control design. **B4-Mechatronic-3** The electronic amplifier -The magnetic amplifier – The potentiometer -.The tachometer -.The mechanical differential - The DC motor - The DC generator - The amplidyne - The electric network. **C4-Medical-3** Diagnostic Ultrasound: Introduction – Fundamentals of acoustic propagation – Ultrasonic transducers and arrays – Gray – Scale ultrasonic imaging – Doppler measurements – Flow and Displacement imaging.				

Code	ACE 416				
Title	Elective -5				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1			3
Syllabus	**A5-Applications of PLC in process control** Introduction to PLC - PLC circuit interface - PLC sensor interface - Networking PLC. **B5-Renewable energy** Introduction to renewable energy - Renewable energy implementation - Main elements in renewable energy - Control of renewable energy. **C5-Applications of microcontroller in process control** Introduction to microcontroller - Microcontroller circuit interface - Microcontroller sensor interface - Networking microcontroller.				

Code	ACE 417				
Title	Project				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	1			3	4
Syllabus	The student deals with the analysis and design of a complete engineering system using the fundamentals , principles and skills he gained during his study the project's report presented by the student Include the details of the analysis and design satisfying the concerned code requirements, the computer applications engineering drawing of his design . Throughout the project report and at oral the exam the student should prove his complete understanding of the elements of the project and his capability to apply them in his future engineering career.				

Second Semester

Code	ACE 421				
Title	Industrial automation Systems				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1			3
Syllabus	Introduction to automated systems - Supervisory control - Data acquisition in automated system – SCADA - SCADA Configuration - SCADA Communication - Distributed Control System - Applications of Automation system (Robotics and CNC machines) - CNC fundamentals-Components-programming.				

Code	ACE 422				
Title	Applications of Industrial Electronics				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1			3
Syllabus	Motor control (VSD, soft starters)- Interfacing with PLC or process controllers - DC motor drives - Industrial control - Standby power systems (UPS , ATS) - Power factor correction, and Harmonic detection and filtering - Battery charging and charge controllers - Automatic voltage regulators - Electric network analyzer and circuit breakers - Fire alarm and fire fighting systems.				

Code	ACE 423				
Title	Intelligent Control Systems				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1			3
Syllabus	Introduction to intelligent control systems - Fuzzy Set Theory - Fuzzy Operations and Relations - Fuzzy Rule Based System - Design and Structure of Fuzzy Logic Control Systems - Types of Fuzzy Logic Control Systems - Some of Fuzzy Logic Control System Applications -Introduction to Neural networks - Biological and Artificial Models of Neural Networks - Neural Networks learning Rules - Back-Propagation Neural Networks - Neural Networks in Process Modeling and Control - Some of Neural Networks Applications.				

Code	ACE 424				
Title	Control systems Applications -4				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	1		2		3
Syllabus	Medical Experiments (Skin electrical resistance - Physiological response to stimulation - Body temperature measurements - Pulse measurement - Respiration rate measurement) - CSN Experiments (temperature converter - Infrared sensor experimentation - Ultrasonic sensor experimentation) - Computer experiments (Livewire tutorial: drawing and simulation the circuits - Proteus tutorial: drawing and simulation the circuits) – Matlab experiments (Medical image segmentation - Medical image registration - Medical image compression).				

Code	UR 425				
Title	Engineering Economics and Legislations				
Field	University Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1			3
Syllabus	Making economic decisions - The time value of money – Equivalence - Global trade - Foreign exchange - Other global topics - Quality management systems.				

Code	ACE 426				
Title	Elective -6				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1			3
Syllabus	**A6-Industrial Electronic Application** Motor drives - Dc motor drives - Ac motor drives. **B6-Mechatronic-4** mechanical components -Degree of freedom - Rotational mechanical component - Electrical components - Series and parallel laws - Series and parallel electric circuits - Series and parallel mechanical elements - Grounded chair representation – Analogies - Scale factors and units - Thermal systems - Fluid				

	systems – Linearization of nonlinear functions - Linearization of operating curves - Hydraulic systems and hydraulic servo motor - Jet pipe amplifier - Pneumatic systems and pneumatic controllers- AC motors - Speed control systems. **C6-Medical-4** Nuclear Medicine Equipment: Tomographic nuclear medical imaging – The gamma camera – Planar imaging – Specification of camera performance – Position emission tomography (PET) – Single-photon emission computed tomography (SPECT) – Data processing – Angiography and mammography.

Code	**ACE 427**				
Title	**Graduation Project**				
Field	**Specialization Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	1			**3**	**4**
Syllabus	Students complete their projects which they started in First Term.				

Syllabus of Courses

Department:

Computer Science and Engineering

Third Year

Third Year

First Semester

Code	CSE 311				
Title	Computer Architecture				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1			3
Syllabus	This course covers Computer Architecture from the Structure and Function point of view. It covers computer function and interconnection including: Instruction Cycle, Interrupts, the Indirect Cycle, Data Flow, Bus Interconnection, Bus Structure, Multiple-Bus Hierarchies, Elements of Bus Design, PCI. The CPU Structure and Function including Processor Organization, Register Organization: User-Visible Registers, Control and Status Registers, Instruction Pipelining: Pipelining Strategy, Pipeline Performance, Dealing with Branches, Intel 80486 Pipelining, and the Pentium Processor. Internal Memory: Characteristics of Memory Systems, The Memory Hierarchy, Semiconductor Main Memory: Organization, Random Access Memory (RAM), Read Only Memory (ROM), Memory Pin Connections, Address Decoding: Simple NAND Gate Decoder, Word Length Expansion, Capacity Expansion, Memory Expansion Examples, Memory Connection to CPU. Cache Memory: Cache Memory Principles, Elements of Cache Design, Cache Size, Mapping Function, Replacement Algorithms, Write Policy, Line Size, Cache initialization, Pentium 4 Cache Organization. It also covers the Input Output Organization, Reduced Instruction Set Computers, Instruction Level Parallelism and Superscalar Processors.				

Code	CSE 312				
Title	Advanced Programming Languages				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2		2		4
Syllabus	The OOP programming language concepts and fundamentals: Variables, Data Types, constants and Operators, console Input/output Statements, flow control, looping, and exception handling. Create, initialize, and use of Arrays, Foreach loop, Understanding the Arrays Class, Fixed and Dynamic Length Array, Structures, Arrays of Structures, and Enumerations. Create methods that can return values and take parameters and understand				

	Method Overloaded. Explain the basic concepts and terminology of object-oriented programming Classes and Objects including Class Basics, Objects, Properties, The Reference this, Static Members of class, Constructors, Destructors, Method and Constructor Overloading. Create, initialize, and destroy objects in application. Build new classes from existing classes. Create self-contained classes and frameworks in application. Define operators, use delegates, and add event specifications. Implement properties and indexers. Use predefined and custom attributes. Inheritance and Polymorphism: Creating a Derived Class, Demonstrating Inheritance, adding Functionality to a Derived Class, Overriding Base Class Functionality, Calling Base Class Functionality, Multi-Level Hierarchies, Preventing Inheritance, Single and Multiple Inheritance, Constructors and Inheritance, Destructors and Inheritance, Polymorphism. Windows Programming: First Windows Form, Properties and Events, Adding Controls to a Blank Form, Properties of Control, Adding Code to a Button, A MessageBox, Adding Menus to Windows Forms, Adding Images, Open File Dialogue Box, Open a Text File with the Open File Dialogue Box, Add a Save as Dialogue Box to your Programs, Checkboxes and Radio Buttons.

Code	**CSE 313**				
Title	**Computer Networks**				
Field	**Specialization Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2	**2**			**4**
Syllabus	Introduction to Analog and Digital Transmission, Data Transmission Issues, Asynchronous and Synchronous Transmission, General Introduction to Network Basics, Network & Networking Components, Topologies, and Protocols, Communication Networking Techniques, Circuit, Message, and Packet Switching, Open System Interconnection (OSI), Media Access Control (MAC), and Internetworking.				

Code	**CSE 314**				
Title	**Artificial Intelligence**				
Field	**Specialization Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2	**1**			**3**
Syllabus	Overview of Artificial Intelligence concepts, Problem and Problem spaces concepts, Production System Characteristics, Basic search, Heuristic search, Knowledge Representation Techniques, Overview of Learning methods.				

Code	CSE 315				
Title	Elective Course (1)				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1			3
Syllabus	**A1. Computer Graphics:** Introduction: Image and pixels, Colors and color spaces, Color monitors, and Graphics systems. Graphic primitives: Introduction, Specification of graphics primitives, and Raster scan features. Object geometry in mathematical view: Points, Cartesian and polar coordinates, Circular arcs, Lines, Homogeneous coordinates of a point, Object geometry in 3D, and Revision matrix multiplication. Object transformation in 2D: Introduction, Combining affine transformations and Transformations in 2D. Object transformation in 3D: Introduction, Matrices, and Transformations in 3D. Scan converting algorithms: Introduction, Bresenham's line algorithm, Midpoint line algorithm, Circles and Ellipses. **B1. Neural Networks** Introduction- models of neurons- network architecture- Learning process- error-correction learning- hebbian learning- supervised learning. Distributed memory mapping correlation matrix memory - Perceptron convergence theorem- Multi-layer perceptrons- back-propagation- accelerated convergence- Case studies. **C1. Computer Peripherals:** Computer system peripherals – video display units – Serial access mass storage devices Input / Output Devices –Asynchronous data communication – RS232 and RS422 protocol – Universal Asynchronous Receiver Transmitter (UART). Synchronous data communication: General format, Universal Synchronous Receiver and Transmitter (USART), High level Data link control (HDLC) protocol and Synchronous Data Link Control (SDLC) protocol- Parallel port - parallel data communication – interface. System bus – types – processor bus – memory bus – I/O buses –ISA bus – microchannel bus – EISA bus – local buses – VESA local bus – PCI bus – SCSI – USB. Printers and scanners.				

Code	CSE 316				
Title	Elective Course (2)				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1			3
Syllabus	**D1. Formal Languages and Automata:** The objective of this course is to acquaint students with the				

	concepts of formal languages and automata. Overview of Languages: Formal Languages and Automata, Basic Concepts of Languages, Some Examples of Languages. Regular Languages: Regular Expressions, Operations on Languages, Properties of Regular Languages, Finite Automata: Finite Automaton as a Machine, Representation of Finite Automata, Languages Accepted by FA, Types of Finite Automata (FA), Deterministic Finite Automata (DFA), Nondeterministic Finite Automata (NFA), Conversion from NFA to DFA, Applications of Finite Automata. Grammars: Formal Grammars, Classes of Grammars, Context Free Grammars, Ambiguous Grammars, Simple Restrictions on Grammars. Turing Machines: Definition of Turning Machines, Describing Turing Machines, Varieties of Turing Machines, What Can Be Computed, What Cannot Be Computed, Universal Turing Machines, Non-deterministic Turing machines, Restricted Turing Machines, What can we learn from Turing machines? **E1. Computer and Information Security:** Security services, mechanisms, and attacks. Classical encryption techniques. Types of encryption algorithms. Block cipher algorithms (DES, TDES, RC5, RC6, Bluefish,…..). Advanced Encryption Standard (AES). Stream cipher algorithms (RSA, El-Gammal, Elliptic curve). RSA case study. Cryptanalysis. **F1. Modeling and Simulation:** Basic simulation modeling: System, models, and simulation, Simulation and programming, Simulation approaches. Informal and formal models: Build an accurate and acceptable model of a problem, Activities and queues, Handling time, Simulation record sheet. Simulation and modeling for digital system: Time driven simulation, Event driven simulation, modeling of blocks, Infrastructure of the simulator, Scheduler module and component status module, Main activities of simulator core.

Code	**UR 317**				
Title	**Professional ethics and quality of the product**				
Field	**Humanities and Social Science**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2	**1**			**3**
Syllabus	General ethics for the engineer, Decision analysis, New trends for both quality adjustment and improving and their applications in both industry and industrial services, The general framework for the operation of quality systems with a focus on quantitative techniques to adopt the quality, The use of computer software tools to assure the quality targets.				

Second Semester

Code	CSE 321				
Title	**Parallel Processing**				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1			3
Syllabus	Introduction to parallel processing: Evolution of computer systems, Parallelism in uniprocessor systems, Parallel computer structures, and Architecture classification Schemes, Parallel processing Applications. Principles of Pipelining and vector processing requirements: Pipelining (an overlap parallelism), Instruction and arithmetic pipelines, principles of designing pipelined processor, Vector processor requirements. Structures and Algorithms for array processors: SIMD array processors, SIMD interconnection networks, Parallel Algorithms for Array processing, Associative Array processing. Multiprocessor Architecture and programming: Functional Structures, Interconnection Networks, Parallel Memory organization, Multiprocessor Operating systems, Exploiting concurrency for multiprocessing.				

Code	CSE 322				
Title	**Software Engineering**				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2		2		4
Syllabus	Introduction: Introduction to software engineering, Importance of software, The Software evolution, Software characteristics, Software components, Software applications, Crisis-Problem and causes. Software development life-cycle: Requirement analysis, software design, coding, testing and maintenance etc. Software requirement Specification: Water fall model, prototyping interactive enhancement, spiral model role of management in software development, role of matrices and measurement, Problem analysis, requirement specification, validation, matrices, monitoring and control. System Design: Problem partitioning, abstraction, top down and bottom up – design, structured approach, functional versus object oriented approach, design specification and verification matrices, monitoring and control, Cohesiveness, coupling, 4 GL. Coding: TOP-DOWN and BOTTOM-UP structure programming, information hiding, programming style, and internal documentation, verification, metrics, monitoring and control. Testing: levels of testing,				

	functional testing, structural testing, test plane, test class specification, reliability assessment, Software testing strategies, Verification and validation, Unit, Integration Testing, Top down and bottom up integration testing, Alpha and Beta testing, System testing and debugging. Software project Management: Cost estimation, project scheduling, staffing, software configuration management, structured Vs unstructured maintenance, quality assurance, project monitoring, risk management. Function oriented and object oriented Software design: Overview of SA/SD Methodology, structured analysis, data flow diagrams, extending DFD to real time systems, Object oriented design, Graphical representation of OOD, Generic OO development paradigm.Software Reliability and Quality Assurance: Reliability issues, Reliability metrics, reliability growth modeling, Software quality, ISO 9000 certification for software industry, SEI capability maturity model, comparison between ISO & SEI CMM.

Code	**CSE 323**				
Title	**Advanced Computer Networks**				
Field	**Specialization Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2		**1**		**3**
Syllabus	Networking and Internetworking concepts and fundamentals. Understand media access control protocols for high speed networks. Understanding Fast Access Technologies: such as ADSL, HDSL, and Cable Modems. Understanding ISDNs, TCP/IP, TCP/UDP, SPX/IPX, WWW, e-mail, DNS, network Security & Firewalls. Understanding WLAN, and Quality of Service for networking and internetworking technologies. Understanding the definition, architecture and components of Grid Computing.				

Code	**CSE 324**				
Title	**Operating Systems**				
Field	**Specialization Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2		**1**		**3**
Syllabus	Introduction to OS. Operating system functions, evaluation of O.S., Different types of O.S.: batch, multi-programmed, time-sharing, real-time, distributed, parallel- Operating system structure (simple, layered, virtual machine), O/S services, system calls.- Process Management -Processes Concept of processes, process scheduling, operations on processes, co-operating processes,				

	interprocess communication.-Threads overview, benefits of threads, user and kernel threads.- CPU scheduling,: scheduling criteria, preemptive ,non-preemptive scheduling, scheduling algorithms, (FCFS, SJF, RR, priority), -Deadlocks system model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock.- Memory Management background, logical vs. physical address space, swapping, contiguous memory, allocation, paging, segmentation, segmentation with paging.- Virtual Memory ,- Mass-storage Structure.

Code	**CSE 325**				
Title	**Image Processing**				
Field	**Specialization Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2	**1**			**3**
Syllabus	Introduction: What Is Digital Image Processing? The Origins of Digital Image Processing, Examples of Fields that Use Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System. Digital Image Fundamentals: Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling and Quantization, Linear and Nonlinear Operations. Image Enhancement: Image Enhancement in the Spatial Domain, Image Enhancement in the Frequency. Image Restoration: A Model of the Image Degradation/Restoration Process, Restoration in the Presence of Noise Only–Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Inverse Filtering. Color Image Processing: Color Fundamentals, Pseudocolor Image Processing, Color Transformations, Color Segmentation. Image Compression: Introduction, Image Compression Models, Elements of Information Theory, Lossy Compression, Image Compression Standards.				

Code	**CSE 326**				
Title	**Elective Course (3)**				
Field	**Specialization Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2	**1**			**3**
Syllabus	**A2. Advanced Computer Graphics:** Direct X: Direct 3D architecture, Primitives point, line triangle, Overview of resources: Texture / vertex / buffers/ index buffers /				

	Surface / depth buffers / stencil buffers / render targets / flichain, states.state management and examples Vertex / index buffers. Open GL: OpenGL over windows, OpenGL over Linux, OpenGL extensions, OpenGL programming language, Shadowing Techniques, Buffer rendering, xture mapping. Advanced Rendering Techniques: Photorealistic rendering: Global Illumination, Participating media rendering, Ray Tracing, Monte Carlo algorithm, Photon mapping. Volume Rendering: Volume graphics overview, Marching cubes, Direct volume rendering. Surfaces and Meshes: Subdivision, Distance fields and level sets, Physically-based Modeling, Stable fluid Solver, Lattice Boltzmann method, Graphics Hardware, Cg programming, General-Purpose computation. **B2. Expert Systems** Overview of expert systems, Review of knowledge representation, Review of inference techniques, Review of expert system development software, Study of logic, Introduction to rule-based expert systems, Demonstration of a rule-based expert system, Building a small rule-based expert system, Advance expert system programming techniques. **C2. Optical Computers:** Understanding of optical computer systems for processing- Topics include use of coherent optical systems for image processing and pattern recognition- principles of holography- and acousto-optic systems for radar-signal-processing optical computers. One dimensional Fourier analysis- two-dimensional Fourier analysis- followed by its application to optical systems analysis.

Code	**CSE 327**				
Title	**Elective Course (4)**				
Field	**Specialization Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2		**1**		**3**
Syllabus	**D2. Data Mining** Data - Exploring Data - Classification: Basic Concepts, Decision Trees, and Model Evaluation,- Classification : Alternative Techniques ,Association Analysis: Basic Concepts and Algorithms - Association Analysis: Advanced Concepts -Cluster Analysis: Basic Concepts and Algorithms ,Cluster Analysis: Additional Issues and Algorithms.				

	E2. High performance Computers Classification of parallel computing structures, instruction level parallelism - static and dynamic pipelining, improving branch performance, superscalar and VLIW processors; High performance memory system; Shared memory multiprocessors and cache coherence; Multiprocessor interconnection networks; Performance modelling; issues in programming multiprocessors; Data parallel architectures. **F2. Bioinformatics:** Bioinformatics course syllabus: Introduction, review of biochemistry and molecular biology - Computers and biology - Online resources for bioinformatics - Simple pairwise alignment - BLAST searching - Multiple sequence alignment - Gene expression and microarrays - Gene expression and SAGE - Introduction to protein structure and structural databases - Molecular visualization - Proteomics - Phylogeny, cladistics, and Evolution - The human genome project - Bioinformatics and human disease.

Syllabus of Courses

Department:

Computer Science and Engineering

Fourth Year

Fourth Year

First Semester

Code	CSE 411				
Title	**Distributed Systems**				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2	1			3
Syllabus	What's a Distributed System, Examples Distributed Systems, What do we want from a Distributed System?, Elements of a Distributed System, Foundations of Distributed Systems, Operating System Support, process management, Process migration, Remote Procedure Call (RPC), Distributed Objects, Distributed File Systems. Content Distribution Networks, Shared Data and Transactions, Distributed Transactions.				

Code	CSE 412				
Title	**Compiler Design**				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2		2		4
Syllabus	Introduction: Systems Programs and Translators: Types of Translators, What is a Compiler? The Phases of a Compiler: Lexical Analysis (Scanner), Syntax Analysis Phase, Global Optimization, The Symbol Table, Code Generation, Local Optimization. Lexical Analysis: Introduction, Formal Languages, Language Elements, Finite State Machines, Regular Expressions, Lexical Tokens, Implementation with Finite State Machines, Examples of Finite State Machines, Actions for Finite State Machines, Lexical Tables, Sequential Search, Binary Search Tree, Hash Table. Syntax Analysis: Introduction, Grammars, Classes of Grammars, Context-Free Grammars, Pushdown Machines, Machines and Classes of Languages Correspondence, Ambiguities in Programming Languages. Top Down Parsing: Introduction, Relations and Closure, Simple Grammars, Parsing Simple Languages with Pushdown Machines, Recursive Descent Parsers for Simple Grammars, Quasi-Simple Grammars, Pushdown Machines for Quasi-Simple Grammars, Recursive Descent for Quasi-Simple Grammars, Final Remark on epsilon Rules. LL(1) Grammars, Pushdown Machines for LL(1) Grammar, Recursive Descent for LL(1) Grammars, Parsing Arithmetic Expressions Top Down, Translating Control Structures. Bottom Up Parsing:				

	Introduction, Shift Reduce Parsing, LR Parsing With Tables. Code Generation: Introduction to Code Generation, Converting Atoms to Instructions, Single Pass vs. Multiple Passes, Register Allocation. Optimization: Introduction and View of Optimization, Global Optimization, Basic Blocks and DAGs, Other Global Optimization Techniques, Local Optimization

Code	**CSE 413**				
Title	**Network security**				
Field	**Specialization Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2	**1**	**1**		**4**
Syllabus	Characteristics of wired and wireless networks. Security of wireless networks. Security of Bluetooth. Security of WLAN. Security of GSM. Security of Satellite. Authentication (Kerberos, X.509). Electronic mail security, IP security. Intruders and intrusion detection techniques. Firewalls.				

Code	**CSE 414**				
Title	**Advanced Database**				
Field	**Specialization Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2		**2**		**4**
Syllabus	Overview Concept of SQL, views, Nested subqueries - Normalization using functional dependencies, Decomposition, Boyce - Code Normal Form, 3NF, Normalization using multi-valued dependencies , 4NF, 5NF-Database security application development using SQL- Distributed Database- Data mining.				

Code	**CSE 415**				
Title	**Multimedia**				
Field	**Specialization Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2	**1**			**3**
Syllabus	Multimedia (MM) & Virtual Reality, Virtual Reality Devices, Virtual Reality Systems, Virtual Reality Applications, and Virtual Reality for education Understanding what is MM, the relevance and underlying infrastructure of the MM. Understanding the core				

	multimedia technologies and standards (Digital Audio, Graphics, Video, Video Conferencing (VC), data transmission/compression), and VC Standards. Be aware of factors involved in MM performance, integration and evaluation, and MM on the WWW.

Code	**CSE 416**				
Title	**Elective Course (5)**				
Field	**Specialization Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2	**1**			**3**
Syllabus	**A3. Computer vision** What is computer vision? Why is it difficult? Which cues do humans use to perceive? Application areas. Image Representation, Review of Linear Algebra, Geometrical Transformations. Introduction to Matlab, Handling Images in Matlab, Image Formation, Point Processing, Blob Processing, Binary image analysis, Thresholding, Connected component analysis, Mathematical morphology, Region properties. Linear filters, convolution, smoothing, derivatives, Fourier transform, sampling and aliazing, gaussian pyramids. Derivatives, Edge detection, Hough Transform. Texture analysis and synthesis. Harris Detector, Local invariant points, SIFT descriptors, Radiometry, measuring light, Color perception, color spaces, Perspective projection, Pinhole camera model, Lenses, Camera geometry, camera calibration, Epipolar geometry, Stereopsis, Matching, Reconstruction, Optical flow, structure from motion, Tracking, Homographies, Image Mosaics, Segmentation, Grouping, Fitting, Model based and template matching based methods for recognition, Retrieval, browsing and other novel applications on large datasests. Camera models, Calibration, multi-views projective geometry and invariants. Edge/feature extraction, correspondence and tracking, 3D structure/motion estimation. Object recognition, Scene and activity interpretation **B3. Multi Agent System** General introduction to the concept of agent and multi-agent system, agent system architecture, types of agent system, Distributed problem solving, Agents communication and agent communication languages, Agents cooperation, coordination and negotiation. **C3. Advanced topics in computer Engineering-1:** **a- System Design Using FPGA**: Introduction to ASICs and FPGAs - Fundamentals in digital IC design - FPGA & CPLD				

	Architectures - FPGA Programming Technologies - FPGA Logic Cell Structures - FPGA Programmable Interconnect and I/O Ports - FPGA Implementation of Combinational Circuits - FPGA Sequential Circuits - Timing Issues in FPGA Synchronous Circuits - Introduction to VHDL and FPGA - Design flow with using VHDL - FPGA Arithmetic Circuits - FPGA Microprocessor design. **b- Advanced Computer System Architecture:** The macro structure and instruction set of computer systems. Survey of characteristic architectures of central processors and systems. Topics selected from mini-, micro-, large-scale and highly parallel computers. I/O control; associative memories; characteristics of storage devices; paging; multiprocessors; terminals. Design of the computer utility and other communications-oriented systems. **c- Real time systems:** Introduction to the problems and techniques of designing and developing real-time systems. Topics will include components of real-time and embedded systems, system and device architecture, synchronous and asynchronous event handling, multi-tasking in real-time systems, scheduling and synchronization, and real-time data acquisition and control. Building systems and simulations in real-time environments, with real-time kernels. Real-Time Applications; Hard Versus Soft Real-Time Systems; Reference Model of Real-Time Systems; Commonly Used Approaches to Hard Real-Time Scheduling; Clock-Driven Scheduling; Priority-Driven Scheduling of Periodic Tasks; Scheduling Aperiodic and Sporadic Jobs in Priority-Driven Systems; Resources and Resource Access Control; Multiprocessor Scheduling and Resource Access Control; scheduling Flexible Computations and Tasks with Temporal Distance Constraints Real-Time Communications.

Code	**CSE 417**				
Title	**Graduation Project**				
Field	**Specialization Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	1			**3**	**4**
Syllabus	A major independent project under the supervision of a staff member; to enable the student to understand and apply the knowledge gained throughout his coursework to an engineering problem at large scale- at the end of the project, the student should submit a report.				

Second Semester

Code	CSE 421				
Title	**Embedded Systems**				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2		1		3
Syllabus	Introduction to embedded systems hardware needs; typical and advanced, timing diagrams, memories (RAM, ROM, EPROM) Tristate devices, Buses, DMA, UART and PLD's Built-ins on the microprocessor. Interrupts basics, ISR; Context saving, shared data problem. Atomic and critical section, interrupt latency. Survey of software architectures, Round Robin, Function queue scheduling architecture, Use of real time operating system. RTOS, Tasks, Scheduler, Shared data reentrancy, priority inversion, mutex binary semaphore and counting semaphore. Inter task communication, message queue, mailboxes and pipes, timer functions, events Interrupt routines in an RTOS environment. Embedded system software design using an RTOS Hard real-time and soft real-time system principles, Task division, need of interrupt routines, shared data. Embedded Software development tools. Host and target systems, cross compilers, linkers, locators for embedded systems. Getting embedded software in to the target system. Debugging techniques. Testing on host machine, Instruction set emulators, logic analyzers, and In-circuit emulators and monitors.				

Code	CSE 422				
Title	**Advanced Software Engineering**				
Field	Specialization Requirements				
Hours	Lecture	Tutorial	Lab.	Practical	Total
	2		1		3
Syllabus	Introduction: Why object orientation, History and development of Object Oriented Programming language, concepts of object oriented programming language. Object oriented analysis: Usecase diagram; Major and minor elements, Object, Class. Object oriented design: Relationships among objects, aggregation, links, relationships among classes- association, aggregation, using instantiation, meta-class, grouping constructs. Basic concepts of object oriented programming using Java: Object, class, message passing, encapsulation, polymorphism, aggregation, threading, applet programming, difference between OOP and other conventional programming-advantages and disadvantages.				

	Fundamentals of Object Oriented design in UML: Static and dynamic models, why modeling, UML diagrams: Class diagram, interaction diagram: collaboration diagram, sequence diagram, state chart diagram, activity diagram, implementation diagram, UML extensibility- model constraints and comments, Note, Stereotype.

Code	**CSE 423**				
Title	**Network Programming**				
Field	**Specialization Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2		**1**		**3**
Syllabus	The OSI-RM Protocols, The DoD Protocols, TCP/IP Introduction and Overview, The Client / Server Model and Software Design, Concurrent Processing in Client / Server Software, Program Interface to Protocols, Basics for Sockets Programming (Berkeley Sockets, and Library Routines), The Socket Interface, Socket Implementation, Windows Sockets (WinSock), Internet Sockets, Remote Procedure Call Concept (RPC), Remote Login, Network Security (Trivial File Transfer Protocol).				

Code	**CSE 424**				
Title	**Advanced Operating Systems**				
Field	**Specialization Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2		**1**		**3**
Syllabus	Introduction to OS - Mass passing - remote procedure calls - distributed shared memory – synchronization- resource management-file system implementation- file system structure-mass storage structure. Basics of Distributed Operating systems.				

Code	**UR 425**				
Title	**Engineering Economics and Legislations**				
Field	**Humanities and Social Science**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	2	**1**			**3**
Syllabus	**The organizing laws of work- the public work sector laws**				

<table>
<tr><td>Code</td><td colspan="5">CSE 426</td></tr>
<tr><td>Title</td><td colspan="5">Elective Course (6)</td></tr>
<tr><td>Field</td><td colspan="5">Specialization Requirements</td></tr>
<tr><td rowspan="2">Hours</td><td>Lecture</td><td>Tutorial</td><td>Lab.</td><td>Practical</td><td>Total</td></tr>
<tr><td>2</td><td>1</td><td></td><td></td><td>3</td></tr>
<tr><td>Syllabus</td><td colspan="5">

D3. Distributed Database

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

E3. Microcontroller System Design:

Course Introduction - Embedded System Concepts & Microcontroller Features - Lab Introduction and Resources - PIC Architecture & Assembly Language Programming - PIC Programming in C - PIC18F Hardware Connections - PIC Timers & Serial I/O - Interrupt Concepts - ADC, DAC, and Sensor Interfacing - Other concepts and applications

F3. Advanced topics in computer engineering-2:

a- DNA Computing: Models of Computation: Circuits, Turing Machines, String Rewriting, Cellular Automata - Organization and Impact of Costs - Semiconductor Roadmap - Physics of devices...signal restoration - Complexity of Computation: Circuit complexity, time complexity, P vs NP - Introduction, review of biochemistry and molecular biology - Computers and biology - Molecular Architecture - DNA Computing - Tools for Manipulation at nanoscale from Microbiology: Nucleic Acid synthesis, PCR, Plasmids, Standard assembly techniques for nucleic acid - Algorithmic Self-assembly, DNA nanotechnology - Design of Digital Logic by Genetic Regulatory Circuits - Molecular Electronic Devices - Error Models and Hierarchical Error Correction - Error Correction in Cellular Automata.

b- Cloud Computing: The outline of the course syllabus is as under: New Computing Paradigms & Services: Cloud computing - Edge computing - Grid computing - Utility computing. Introduction to Cloud Computing: Cloud Computing Architectural Framework - Cloud Deployment Models - Virtualization in Cloud Computing - Parallelization in Cloud Computing - Security for

</td></tr>
</table>

	Cloud Computing - Cloud Economics. Cloud Service Models: Software as a Service (SaaS) - Infrastructure as a Service (IaaS) - Platform as a Service (PaaS). Foundational Elements of Cloud Computing: Virtualization - Introduction to Grid technology - Introduction to Distributed Computing - Browser as a platform - Introduction to Web 2.0 - Introduction to Autonomic Systems - Service Level Agreements. Case Studies. Lab./Practical sessions: Virtualization - Cloud Computing Operating System - Creating Windows servers on the cloud - Creating Linux servers on the cloud - Deploying applications on the cloud - Major cloud solutions. **c- Distributed Algorithms:** Models of synchronous and asynchronous distributed computing systems; synchronous networks, asynchronous shared memory, asynchronous networks etc; basic algorithms for synchronous networks; leader election, breadth first search, shortest path, minimum spanning tree etc.; advanced synchronous algorithms; distributed consensus with failures, commit protocols; asynchronous shared memory algorithms; mutual exclusion and consensus; relationship between shared memory and network models; asynchronous networks with failures.

Code	**CSE 427**				
Title	**Graduation Project**				
Field	**Specialization Requirements**				
Hours	**Lecture**	**Tutorial**	**Lab.**	**Practical**	**Total**
	1			**3**	**4**
Syllabus	A major independent project under the supervision of a staff member; to enable the student to understand and apply the knowledge gained throughout his coursework to an engineering problem at large scale- at the end of the project, the student should submit a report.				

Intended Learning Outcomes

(ILOs)

Intended Learning Outcomes (ILOs)

Electronics and Electrical Communications Engineering

On successful completion of the Electronics and Electrical Communications Engineering programme, graduates should have many skills. In addition to the general attributes of engineer, the electronics engineer must have knowledge and understanding of the field of Electronics and Electrical Communications Engineering, acquired intellectual skills, professional and practical skills.

A. Knowledge and Understanding:

On successful completion, graduates should be able to demonstrate knowledge and understanding of:

a1) Basics of mathematical techniques to help model and analyze systems, and use mathematics as a tool for communicating results and concepts;

a2) Elementary science underlying electronic engineering systems and information technology.

a3) Basics of design and analyzing electronic engineering systems, while considering the constraints of applying inappropriate technology and the needs of commercial risk evaluation.

a4) Managing and practicing business, including finance, law, marketing and quality control.

a5) The professional and ethical responsibilities of engineer

a6) Analyzing and design of electronic circuits and components.

a7) Analyzing and design of control systems with performance evaluation.

a8) Biomedical instrumentation.

a9) A range of programming languages and environments.

a10) Broad lines of industrial process engineering.

a11) Communication systems.

a12) Coding and decoding techniques.

a13) Microwave applications.

a14) Antenna and wave propagation.

a15) Nanotechnology application.

a16) Usage of optical fiber.

a17) Methods of fabrication of Integrated circuits.

a18) Analysis of signal processing.

a19) Optical communication systems.

B. Intellectual Skills

On Successful completion, graduates should be able to:

b1) Select and apply appropriate scientific principles, mathematical and computer-based methods for analyzing general electronic engineering systems.

b2) Initiate creative thinking for resolving and developing innovative solutions for the practical industrial problems.

b3) Organize tasks into a structured form.

b4) Understand the evolving state of knowledge in a rapidly developing area.

b5) Transfer appropriate knowledge and methods from one topic to another.

b6) Plan, conduct and write a report on a project or assignment.

b7) Prepare an oral presentation.

b8) Approach the suitable tools for solving problems to tackle any practical problems in the electronics field.

b9) Analyze, interpret, and explain data and design experiments to obtain new data

b10) Develop computer programs.

b11) Select and apply appropriate IT tools to a verity of engineering problems.

C. Practical Skills

On Successful completion, graduates should be able to:

c1) Use appropriate mathematical methods or IT tools.

c2) Program a computer to solve problems.

c3) Use relevant laboratory equipment and analyze the results correctly.

c4) Troubleshoot, maintain and repair almost all types of electronic systems using the standard tools.

c5) Synthesis and integrate electronic systems for certain specific function using the right equipment.

c6) Design, build and test a system.

c7) Use appropriate analysis and design tools.

c8) Explain appropriate specifications for required devices.

c9) Use appropriate tools to measure system performance.

c10) Program a computer to solve problems.

c11) Utilize project management methods.

c12) Present work both in written and oral form.

D. The attributes of an electronics engineer:

In addition to the general attributes of engineer, the electronics engineer should be able to:

d1) Apply basic knowledge and concepts of mathematics and sciences and engineering principles to electronics systems.

d2) Be able to communicate effectively, both orally and in writing.

d3) Have the ability to design and execute an individual project.

d4) Be able to understand environmental, economics and community impacts on development.

d5) Have the relevant mathematical and computational skills.

d6) Participate in and lead quality improvement projects.

d7) Know the technology required to design, build, operate and maintain electronic systems, analog or/and digital, and all types of computers.

d8) Manipulate with the electronic circuits, all the way from the discrete components level, circuits' analysis and design, to the troubleshooting with emphasis on electronic power devices.

d9) Realize control theory and measurement systems for industrial variables, signal conversion, conditioning and processing.

d10) Deal with the computers hardware, software, operating systems and interfacing.

d11) Know the field of digital and analog communication, mobile communication, coding, and decoding.

d12) Familiarize her/him-self with the nano-technology that will invade the electronics world in the future.

d13) Be able to understand communication systems, signal processing, and optoelectronics.

References:

National Academic Reference Standards (NARS) for Electronic Engineering.

Intended Learning Outcomes (ILOs)

Industrial Electronics and Control Engineering

On successful completion of the Industrial Electronics and Control Engineering programme, graduates should have many skills. In addition to the general attributes of engineer, the electronics engineer must have knowledge and understanding of the field of industrial electronics and control engineering, acquired intellectual skills, professional and practical skills.

A. Knowledge and Understanding:

On successful completion, graduates should be able to demonstrate knowledge and understanding of:

a1) Basics of mathematical techniques to help model and analyze systems, and use mathematics as a tool for communicating results and concepts;

a2) Elementary science underlying electronic engineering systems and information technology.

a3) Basics of design and analyzing electronic engineering systems, while considering the constraints of applying inappropriate technology and the needs of commercial risk evaluation.

a4) Managing and practicing business, including finance, law, marketing and quality control.

a5) The professional and ethical responsibilities of engineer

a6) Analyzing and design of electronic circuits and components.

a7) Analyzing and design of control systems with performance evaluation.

a8) Biomedical engineering principles, biomedical equipment, instrumentation and systems.

a9) A range of programming languages and environments.

a10) Broad lines of industrial process engineering.

a11) Operation and maintenance of control systems,

a12) Measuring instruments, industrial electronics, industrial instrumentation systems and industrial control networks.

a13) System modeling and simulation, transducers and sensors, control devices, digital control, and nonlinear systems.

a14) Industrial automation systems and microcontrollers.

a15) Programmable logic controllers PLC, real time systems robotics, electro-mechanical systems, circuits and systems, environmental preservation

a16) Designing, manufacturing, installing, programming of control systems.

a17) Methods of fabrication of Integrated circuits, production assembling facilities, home automation systems, emission control and environmental preservation facilities

a18) Preparation and installation of wiring diagrams in industrial plants, power plants, nuclear and renewable energy production and systems.

a19) Power electronic components, electrical machines and power systems.

B. Intellectual Skills

On Successful completion, graduates should be able to:

b1) Select and apply appropriate scientific principles, mathematical and computer-based methods for analyzing general electronic engineering systems.

b2) Initiate creative thinking for resolving and developing innovative solutions for the practical industrial problems.

b3) Organize tasks into a structured form.

b4) Understand the evolving state of knowledge in a rapidly developing area.

b5) Transfer appropriate knowledge and methods from one topic to another.

b6) Plan, conduct and write a report on a project or assignment.

b7) Prepare an oral presentation.

b8) Approach the suitable tools for solving problems to tackle any practical problems in the electronics field.

b9) Analyze, interpret, and explain data and design experiments to obtain new data.

b10) Develop computer programs.

b11) Select and apply appropriate IT tools to a verity of engineering problems.

C. Practical Skills

On Successful completion, graduates should be able to:

c1) Use appropriate mathematical methods or IT tools.

c2) Program a computer to solve problems.

c3) Use relevant laboratory equipment and analyze the results correctly.

c4) Troubleshoot, maintain and repair almost all types of electronic systems using the standard tools.

c5) Synthesis and integrate electronic systems for certain specific function using the right equipment.

c6) Design, build and test a system.

c7) Use appropriate analysis and design tools.

c8) Explain appropriate specifications for required devices.

c9) Use appropriate tools to measure system performance.

c10) Program a computer to solve problems.

c11) Utilize project management methods.

c12) Present work both in written and oral form.

D. The attributes of an electronics engineer:

In addition to the general attributes of engineer, the electronics engineer should be able to:

d1) Apply basic knowledge and concepts of mathematics and sciences and engineering principles to electronics systems.

d2) Be able to communicate effectively, both orally and in writing.

d3) Have the ability to design and execute an individual project.

d4) Be able to understand environmental, economics and community impacts on development.

d5) Have the relevant mathematical and computational skills.

d6) Participate in and lead quality improvement projects.

d7) Know the technology required to design, build, operate and maintain electronic systems, Control systems, and all types of computers.

d8) Manipulate with the electronic circuits, all the way from the discrete components level, circuits' analysis and design, to the troubleshooting with emphasis on electronic power devices.

d9) Realize control theory and measurement systems for industrial variables, signal conversion, conditioning and processing.

d10) Deal with the computers hardware, software, operating systems and interfacing.

d11) Know the field of power electronic components and systems, electrical machines and power systems.

d12) Familiarize with the advanced technology that will invade the electronics world in the future.

d13) Be able to understand automatic control systems, and industrial electronics.

References:

National Academic Reference Standards (NARS) for Electronic Engineering.

Intended Learning Outcomes (ILOs)

Computer Science and Engineering

On successful completion of the Computer science and engineering (CSE) programme, graduates should have many skills. In addition to the general attributes of an engineer, computer engineer must have knowledge and understanding of the field of computer science and engineering, intellectual skills, professional and practical skills.

A. Knowledge and Understanding:

On successful completion of the computer science and engineering programme, graduate students should be able to demonstrate knowledge and understanding of:

a1) Essential facts, concepts, principles and theories relevant to computer science and engineering.

a2) Relevant mathematical methods, physical laws and the principles of electronic engineering science as applied to computer engineering systems.

a3) Engineering principles in the fields of logic design, circuit analysis, machine and assembly languages, computer organization and architectures, memory hierarchy, advanced computer architectures, embedded systems, signal processing, operating systems, real-time systems and reliability analysis.

a4) Quality assessment of computer systems.

a5) Principles of design specific to computer engineering.

a6) Broad general education necessary to understand the impact of computer engineering solutions in a global and societal context.

a7) Related research methods and approaches to create more advanced products.

B. Intellectual skills:

On successful completion of this program graduates should be able to:

b1) Demonstrate a high level of competence in identifying, defining and solving computer science and engineering problems.

b2) Select and apply appropriate mathematical tools, computing methods, design techniques and tools in computer engineering disciplines, for modeling and analyzing computer systems.

b3) Evaluate different techniques and strategies for solving computer science and engineering problems.

b4) Maintain a sound theoretical approach in dealing with new and advancing technology.

b5) Select and apply appropriate IT tools to a variety of computer science and engineering problems.

C. Professional and Practical Skills:

On successful completion of this program graduates should be able to:

c1) Use laboratory and field equipment competently and safely.

c2) Observe, record and analyze data in laboratory as well as in the field.

c3) Use appropriate specialized computer software, computational tools and packages.

c4) Write computer programs.

c5) Integrate technical professionalism and societal and ethical responsibility.

D. The attributes of a computer engineer:

On successful completion of this program graduates should be able to:

d1) Apply knowledge of computing, mathematics, physics and logical skills appropriate to the computer science and engineering discipline.

d2) Analyze a problem, and identify and define the computing requirements appropriate to its solution.

d3) Design, implement and evaluate a computer-based system, process, component, or program to meet desired needs.

d4) Use general computer and software tools professionally.

d5) Analyze operations, realize requirements and constraints of projects and, consequently, achieve an appropriate cost effective design.

d6) Perform troubleshooting in computer systems.

d7) Exhibit competency in English as a second language as suitable for the discipline.

d8) Demonstrate inductive reasoning abilities, figuring general rules and conclusions about seemingly unrelated events.

d9) Analyze the local and global impact of computing on individuals, organizations and society.

d10) Use current advanced techniques, skills, and tools necessary for computing practices.

References:

National Academic Reference Standards (NARS) for Computer Engineering.