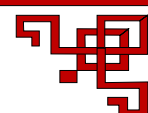
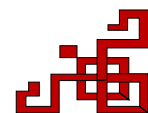
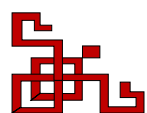


Program of:



**Science and Technology
of Sugar Industry Diploma
(Chemistry Section)**

**(Program Scheme and
Courses Content)**



Program of: Science and Technology of Sugar Industry Diploma (Chemistry Section)

First Year: First Semester

Code	Course Title	No. H.	Prac. H.	Exams		Grade
				Y.W.	Wr.	
SC5101	Electrochemistry and Corrosion.	2		30	70	100
SC5102	Chemical Industries Based on Sugar Cane and its Products.	2		30	70	100
SC5103	Company Laws and Work Legislation	2		30	70	100
SC5104	Sugar Crops Production.	4		60	140	200
SC5105	Language.	2		30	70	100
	Elective Courses (A)*	2		30	70	100
	Elective Courses (B)**	2		30	70	100
	Total	16		240	560	800
	* Elective Courses (A) Choose one from the following:	Note: Course Code Description: Course Name: AB CDEF (AB): is an indicator for the diploma name. (C) : is a number for graduate course level (from 1 to 4). (D) : is a number indicating the semester number. (EF): is a number indicating the serial number of the course during the semester.				
SC5106	Heat and Thermodynamics.					
SC5107	Advanced Analytical Chemistry.					
SC5108	SteroChemistry.					
	** Elective Courses (B) Choose one from the following:					
SC5109	Fermentation.					
SC5110	Environmental Chemistry.					
SC5111	Advanced Inorganic Chemistry.					
*** Extended courses						

**Program of: Science and Technology
of Sugar Industry Diploma
(Chemistry Section)**

First Year: Second Semester

Code	Course Title	No. H.	Prac. H.	Exams		Grade
				Y.W.	Wr.	
SC5201	Applications of Heat and Mass Transfer.	2		30	70	100
SC5202	Technology of Sugar Industry (I).	4		60	140	200
SC5203	Pollution Control in Sugar Factories	2		30	70	100
SC5204	Economic and Management of Sugar Factories	2		30	70	100
SC5205	Technical Writing.	2		30	70	100
	Elective Courses (A)*	2		30	70	100
	Elective Courses (B)**	2		30	70	100
	Total	16		240	560	800
	* Elective Courses (A) Choose one from the following:					
SC5206	Colloids and Surface Chemistry.					
SC5207	Process in Heterogeneous Systems.					
SC5208	Chemistry of Heterocyclic Compounds.					
	** Elective Courses (B) Choose one from the following:					
SC5209	Chemistry of Carbohydrates.					
SC5210	Advanced Organic Chemistry.					
SC5211	Polymer.					
*** Extended courses						

**Program of: Science and Technology
of Sugar Industry Diploma
(Chemistry Section)**

Second Year: First Semester

Code	Course Title	No. H.	Prac. H.	Exams		Grade
				Y.W.	Wr.	
SC5301	Chemical Control in Sugar Factories	2		30	70	100
SC5302	Research Project***.	2		---	---	---
SC5303	Technology of Sugar Industry (II).	4		60	140	200
SC5304	Chemical Laboratory (I)***.	---	4	25	25	50
SC5305	Computer Programming.	2		30	70	100
	Elective Courses (A)*	2		30	70	100
	Elective Courses (B)**	2		30	70	100
	Total	14	4	205	445	650
	* Elective Courses (A) Choose one from the following:					
SC5306	Biochemistry.					
SC5307	Computer Systems and Performance Evaluation.					
SC5308	Instrumental Analysis.					
	** Elective Courses (B) Choose one from the following:					
SC5309	Applied Catalysis.					
SC5310	Process Engineering.					
SC5311	Plant Equipment Planning.					
*** Extended courses						

**Program of: Science and Technology
of Sugar Industry Diploma
(Chemistry Section)**

Second Year: Second Semester

Code	Course Title	No. H.	Prac. H.	Exams		Grade
				Y.W.	Wr.	
SC5401	Quality Control in Sugar Factories.	2		30	70	100
SC5402	Research Project***	2		50	50	100
SC5403	Technology of Sugar Industry (III).	4		60	140	200
SC5404	Chemistry Laboratory(II)***	---	4	25	25	50
SC5405	Statistical Analysis.	2		30	70	100
	Elective Courses (A)*	2		30	70	100
	Elective Courses (B)**	2		30	70	100
	Total	14	4	255	495	750
	* Elective Courses (A) Choose one from the following:					
SC5406	Chromatographic Analysis.					
SC5407	Quality and Management.					
SC5408	Process Control Engineering.					
	** Elective Courses (B) Choose one from the following:					
SC5409	Design of Industrial Waste Treatment System.					
SC5410	Corrosion Control.					
SC5411	Marketing Research.					
SC5412	Project Economics.	*** Extended courses				

First Year: First Semester

SC5101-Electrochemistry and Corrosion: (2h/w)

- 1- Principles of corrosion.
- 2- Electrochemical characteristics, (electrochemical reactions, polarization and passivity).
- 3- Environmental effects.
- 4- Forms of corrosion.
- 5- Anodic and cathodic protection.
- 6- Corrosion inhibitors.
- 7- Inhibition and environments.

**SC5102-Chemical Industries Based on Sugar Cane and its Products :
(2h/w)**

- 1- Ethyl alcohol perfumes industry.
- 2- Formic acid industry.
- 3- Acetic acid industry.
- 4- Butyric acid industry.
- 5- Citric acid industry.
- 6- Glycerol industry.
- 7- Butyl alcohol industry.
- 8- Acetone industry.

SC5103-Companies Laws and Work Legislations: (2h/w)

- 1- Law of work .
- 2- Individual and group work contracts .
- 3- Decrees of syndicates and companies .
- 4- Delimitations of employing delinquents and women, foreigners working for Egyptians and Egyptians working for foreigners.
- 5- Arabic and international work agreements.
- 6- Law of social insurance.
- 7- Kinds of social insurance.
- 8- Study of decrees related to special kind of social insurance.
- 9- Distinguishing between decrees of social insurance and other kinds of Insurance.

SC5104-Sugar Corps Production: (4h/w)

- 1- Botany of sugar crops, particularly, sugar cane and sugar beet.
- 2- Sugar crops classification.

- 3- Environmental factors suitable for production.
- 4- Cultivars.
- 5- Cultural practices & production techniques.
- 6- Quality parameters.
- 7- Principles of crop breeding & improvement & specially sugar crops.
- 8- Genetic basis of sugar crops breeding and improvement.
- 9- Sugar crops breeding methodology i.e., selection methods- hybridization – mutation breeding, biotechnology in breeding.
- 10- Stress breeding of sugar crops i.e., heat, drought, salinity, pests.

SE5105- Language: (2 h/w)

- 1- Introduction.
- 2- Characteristics of the technical English.
- 3- Review of the English grammar.
- 4- Active sentences and its characteristics.
- 5- Some of the common errors in writing technical English sentences.
- 6- Phrasing: (Main idea – Methods of explaining the main idea – Types of phrases – Reading and analyzing some of the technical writing to develop the communication skills).

Note: This Course of Language is to be taught to all specialties.

Elective Courses

(First Year - First Semester)List (A)

SC5106-Heat and Thermodynamics: (2h/w)

- 1- Thermodynamics systems.
- 2- Work.
- 3- Transfer of heat.
- 4- Properties of pure substances.
- 5- The steam engine and refrigerator.
- 6- Applications of thermodynamics to pure substances.
- 7- Applications of thermodynamics to special systems.

SC5107- Advanced Analytical Chemistry: (2h/w)

- Introduction.
- Treatment of analytical data.
- Acid-base titration in non-aqueous solvents.

- Analytical applications of precipitation reactions.
- Analytical applications of oxidation-reaction reactions.
- Methods of separation.
- Applications of solvent-solvent extraction.
- Application of solvent-solid extraction.
- Classical methods in environmental analysis.

SC5108- Stereochemistry: (2h/w)

- Introduction.
- Geometrical isomerism.
- Enantiomerism.
- Fisher, newman and sawhorse projections.
- Optical activity of compounds.
- Conformations.
- Other ring systems.
- Stereochemistry of compounds of elements other than carbon.
- Dynamic stereochemistry.
- Asymmetrical synthesis.

Elective Courses
(First Year - First Semester)List (B)

SC5109- Fermentation: (2h/w)

- I- The propagation of yeast.
 - 1- Bakers Yeast.
 - a- Some general considerations concerning the production of yeast.
 - b- Active dry yeast.
 - c- Food and fodder yeast.
- II- The production of industrial alcohol by fermentation.
- III- The acetone-butanol fermentation.
- IV- The acetone-ethanol fermentation.
- V- Antibiotics:
 - 1- Some isolation methods and screening techniques.
 - 2- Penicillin and cephalosporum.
 - 3- Tetracyclin.
 - 4- Other antibiotics.
- VI- Food enzymes.

- 1- Proteases.
- 2- Amylases and glucoamylases.
- 3- Pectic enzymes.
- 4- Dextranases.
- 5- Celluiases.
- 6- Hemicellulases.
- 7- Lipases.
- 8- Other Enzymes.

VII- Organic acids:

- 1- Citric acid.
- 2- Itaconic acid.
- 3- Gluconic acid.
- 4- Fumaric acid.
- 5- Miscellaneous organic acid reference.

VIII- The microbiological transformation of steroids.

- 1- Methods of transformation.
- 2- Type of transformation Brought about by microorganisms.

IX- The rapeutic metabolites.

- 1- Lovastatin.
- 2- Cyclosporins.
- 3- Ergot alkaloids.

X- Edible mushrooms.

SC5110- Environmental Chemistry: (2h/w)

Air pollution: general consideration, carbon monoxide, nitrogen oxides, hydrocarbons and photochemical oxidants, sulfur oxides, particulates, temperature inversions and the green house effect, Water pollution, general consideration, detergents, synthetic organic pesticides, oil, toxic metals, wastewater treatment.

SC5111- Advanced Inorganic Chemistry: (2h/w)

- Metal carbonyls and related complexes.
- Metal-to-metal bonds and metal atom clusters.
- Transition metal compounds with bonds to hydrogen and carbon.
- Reaction mechanisms and molecular rearrangements in complexes.
- Transition Metal to carbon bonds in synthesis.
- Bioinorganic chemistry.

First Year: Second Semester

SC5201- Applications of Heat and Mass Transfer: (2 h/w)

- 1- Modes of heat transfer.
- 2- Heat conduction.
- 3- Determination of heat transfer coefficient by convection.
- 4- Radiation heat transfer in gases.
- 5- Heat transfer during condensation and evaporation.
- 6- Applications in furnaces and heat exchangers.
- 7- Introduction of mass transfer.
- 8- Mass diffusion – Fick's law – Equation of mass balance in chemical reaction.
- 9- Applications of mass transfer in physical and chemical operations in sugar industry.
- 10- Applications of combined mass and heat transfer.

SC5202- Technology of Sugar Factories (I): (4h/w)

- 1- Juice clarification and purification of impurities and non sugar substances which adverse crystallization process .
- 2- Chemical and physical properties of cane juice
- 3- Methods of clarification
 - a- Use of lime solution and $P_2 O_5$ (Source of $P_2 O_5$ is tricalcium phosphate).
 - b- Use of lime solution and CO_2 purified to produce active calcium carbonate.
 - c- Details of chemical reactions in each method.
 - d- Advantages and disadvantages of each method.
 - e- Sulphonation of syrup.
- 4- Refining of Egyptian raw sugar and imported sugar.
 - a- Affination of raw sugar to remove films of non sugar from crystal Is using centrifuges and dessaliring sugar.
 - b- Chemical treatment using lime and CO_2 (carbonation).
 - c- Chemical reactions included and factors affecting it.
 - d- Purification of CO_2 and its chemical neutralization.
 - e- Use of phosphatation method to clarilyng sugar soluble solution.
 - f- Decolouration of sugar soluble solution by bonechar activated carbon, resins - advantages and disadvantages of each method.
 - g- Boiling system in refining factories.

SC5203- Pollution Control in Sugar Factories:(2h/w)

- 1 - Sources of air pollution and emissions.
- 2 - Environmental impact of air pollution.
- 3 - Thermodynamics, chemical kinetics and air pollution.
- 4 - Meteorology and natural purification processes .
- 5 - Engineered system for air pollution control.
- 6 - Particles, its measurements and control.
- 7 - Measurements and analysis of air pollutants.
- 8 - Sources and control of water pollution in sugar industry.
- 9 - Engineered system for water pollution control.

SC5204- Economic and Management of Sugar Factories: (2h/w)

- 1- Principles and rules of production economics determining the use of agricultural resources in sugar-cane production.
- 2- Economic and productive efficiency of raw sugar industry.
- 3- Risk and uncertainty of sugar-cane production.
- 4- Economic of scale.
- 5- Technological changes of raw sugar industry.
- 6- Planning of raw sugar factories - using some of operations research tools, such as linear programming method and transportation models.
- 7- Practical and applied management of raw sugar factories.
- 8- Economic feasibility study of raw sugar factories and its financial analysis.

SC5205- Technical Writing: (2h/w)

- 1- Elements of technical reports.
- 2- Methods of engineering writing.
- 3- Methods of analyzing the engineering data.
- 4- Correct expressions and analytical reading.
- 5- Report of projects.
- 6- Report of experiments.
- 7- Assignment reports.

Note: This Course of Technical Writing is to be taught to all specialties.

Elective Courses
(First Year - Second Semester)List (A)

SC5206- Colloidal Chemistry and Surface Chemistry: (2h/w)

A- Colloids:

- Preparation, properties.
- The constitution of sols: the electrical double layer.
- Electrokinetic and electrochemical properties of sols.
- The stability of hydrophobic and hydrophilic sols.
- Gelatinous precipitates and jellies of organic and inorganic substances.
- Emulsions: preparation, properties and stability.
- Foams: formation and stability.
- Foams prevention and destruction.
- Applications of colloidal solutions.

B- Surface Chemistry:

- Goal, definition of a surface and definition of porosity.
- SBET theory and its extensions.
- Characterization and measurement of porosity.
- Characterization methods for solid surface, spectroscopy, photoelectronic spectroscopy, thermogravimetric analysis, adsorption methods, diffraction methods.
- Basic groups of porous materials and their applications.

SC5207- Processes in Heterogeneous Systems: (2h/w)

Technical important heterogeneous reactions, gas-liquid reaction, mass transfer, film-, penetration theories, slow, fast and immediate reactions between gas and liquid, reactor design for gas-liquid reactions, kinetics of nucleation on solid surface, Planar model reaction of solid at slow nucleation, Spherical model reaction of solid at slow nucleation, Models of reaction between the grain of solid and fluid, Nonporous solid-fluid reaction, unreacted core model, Porous solid-fluid reaction, grain model, Reactions between grains of solid and fluid in batch reactor, Reactions between grains of solid and fluid in flow reactor, Determination of adjustable parameters in rate equations, Estimation of diffusion coefficients and viscosities of fluids.

SC5208-Chemistry of Heterocyclic Compounds:(2h/w)

A) *Nomenclature of Heterocyclic compounds:*

- Indoles, benzothiophenes and benzofurans;
- Imidazoles and pyrazoles;
- Oxazoles and isoxazoles;
- Thiazoles and isothiazoles;
- Oxadiazoles, triazines, and tetrazines;
- Pyridines and diazines;
- Pyrones, chromones, and coumarins;
- Reduced heterocycles.

B) *Some natural occurrence heterocycles for example:*

- Haemoglobin and chlorophyll are porphyrin derivatives.
- Morphine, strychnine, and emetine (amoebicide) contain cyclic amines.
- Nicotine contains both a pyridine and pyrrolidine.
- Ametryne and related compounds are herbicides containing the triazine ring.

Elective Courses

(First Year - Second Semester)List (B)

SC5209-Chemistry of Carbohydrates: (2h/w)

- 1- Oligosaccharids:
 - a- Disaccharides
 - Reducing sugars e. g. Lactose and Maltose.
 - Non-reducing sugars e. g. sucrose.
 - b- Trisaccharides.
- 2- Poly-saccharides:
 - c- Starch.
 - d- Cellulose.
 - e- Glycogen and Inulin...etc.
- 3- Methods of molecular weight determination.
- 4- Studies on some sugar derivatives e. g. vitamin C (ascorbic acid) and its biosynthesis.
- 5- Glycosides.
- 6- Nucleic acids and their derivatives.
- 7- Sugar alternatives.

SC5210-Advanced Organic Chemistry:(2h/w)

1- Physical organic chemistry:

Types of organic reactions, mechanism of organic reactions.

2-Structure and reactivity of organic compounds:

Hammett and Taft free energy relationships, reaction mechanisms and its relation with free energy.

3- Reaction of carbonyl compounds:

Acid and base catalyses (specific and general), Nucleophilic addition reaction of carbonyl compounds on nitrogen and carbon nucleophiles.

4- Cyclic addition reactions:

Classifications, thermocyclic addition reactions, dipolar cyclic additions.

SC5211- Polymer: (2h/w)

- Introduction to principles of polymer chemistry, terminology.
- Polymer structure, molecular weight systems, and an introduction to the relationship of chemical structure and properties.
- Vinyl polymers. Free radical polymerization, cationic polymerization, anionic polymerization, Ziegler-Natta polymerization, and recently developed polymerization methods.
- Non-vinyl polymers. Polyethers, polyamides, polyurethanes, heterocyclic polymers, etc.
- Heterochain polymers. Polysiloxanes, etc.
- Traditional thermoset polymers. Phenolics, etc.
- More information on relationship of structure to polymer properties, elastomers, etc.

Second Year: First Semester

SC5301-Chemical Control in Sugar Factories: (2h/w)

- 1- Definitions and expressions used in sugar factories.
- 2- Weights and measurements.
- 3- Description and usage of equipments.
- 4- Sampling methods.
- 5- Reagents.
- 6- General analytical methods, products analysis and calculation methods.
- 7- Chemical reagents used in chemical analysis.

- 8- General analytical methods.
- 9- Analytical methods of different products in sugar manufacture.
- 10- Calculation methods used in chemical analysis in sugar manufacture.

SC4302-Research Project*: (2h/w) (to be continued)**

The project must be in one of the chemical problems concerned with the sugar research and chemical technology.

SC5303-Technology of Sugar Industry(II): (4h/w)

- 1- Definition of Sugar manufacture and introduction on manufacturing steps.
- 2- Cane preparation .
- 3- Extraction of the juice by milling and diffusion .
- 4- Filtration of mixed juice .
- 5- Heating of the juice .
- 6- Clarification of the juice after treatment by precipitation .
- 7- Filtration of scums .
- 8- Filtration of clarified juice outside clarification tanks .
- 9- Concentration of juice by evaporation of water.
- 10- Cleaning heat surface of heaters , bodies of multiple evaporation of pan boiling .
- 11- Preparation of superphosphate solution .
- 12- Preparation of lime solution .
- 13- Preparation of SO₂ .
- 14- Design and calculation capacity of instruments used in each mentioned step.

SC5304-Chemistry Laboratory*(I): (4h/w)**

Quantitative analysis experiments related to raw materials, products and Bi-Products of sugar industry.

SC5305-Computer Programming: (2h/w)

- 1- Computer components. (computer generation - components - input and output units - control unit - microprocessor - memory decimal operational system and special letters and characters).
- 2- Basic Programming.
- 3- Fortran Programming.
- 4- Cobol Programming.

Elective Courses

(Second Year - First Semester)List (A)

SC5306-Biochemistry: (2h/w)

- 1- Biochemical aspects of carbohydrates.
- 2- Biochemical aspects of lipids.
- 3- Biochemical aspects of amino acids and proteins.
- 4- Biochemical aspects of nucleic acids and derivatives.
- 5- Enzymes, vitamins and hormones.
- 6- Biochemical oxidation.
- 7- Metabolism of carbohydrates.
- 8- Metabolism of lipids.
- 9- Metabolism of amino acids and proteins.
- 10- Metabolism of important minerals.
- 11- Integration of metabolism.

SC5307-Computer Systems and Performance Evaluation: (2h/w)

Provides a comprehensive overview of the quantitative aspects of computer systems with a particular focus on performance evaluation. Topics include performance measurement, the analysis and interpretation of measurement data, workload characterization and modeling, the design and evaluation of performance experiments, and the design and application of analytical techniques. A variety of application domains will be considered.

SC5308- Instrumental Analysis: (2h/w)

- 1- Electroanalytical methods (Potentiometry – Selective ion electrodes voltammetry).
- 2- U.V. and visible spectrophotometric analysis.
- 3- Atomic absorption method of analysis.
- 4- Turbidimetry and polarimetry method.

Elective Courses

(Second Year - First Semester)List (B)

SC5309- Applied Catalysis: (2h/w)

- 1- General aspects and history of catalysis.
- 2- homogeneous and heterogeneous catalysis.
- 3- Role of catalytic reactions in the chemical industry.
- 4- Importance of catalysis in the national economy.
- 5- Poisoning and regeneration of catalysts.
- 6- Modern methods of studying catalysts.

- 7- Synthesis of methyl alcohol from carbon dioxide and hydrogen.
- 8- Synthesis of different chemicals from ethyl alcohol.
- 9- Esterification reactions.

SC5310-Process Engineering: (2h/w)

Examines the methods of process engineering used to achieve the best overall processing systems and includes, synthesis of structure of process system; process economics; optimization applications and methods; engineering in the presence of uncertainty; simulation approach to difficult processing situations; problem assignments; involving class discussion, with special emphasis on a knowledge of chemical processes.

SC5311- Plant Equipment Planning: (2h/w)

Design and building up of chemical plants. The role of chemical engineer at design of chemical plants. Material and heat balance in projection. Utilization of static and dynamic simulations in design. Transport and dimension of traffic in chemical plants. Energy transfer, heating - cooling, Separation processes in inorganic technology. Absorbers and their characteristics. Drying, types and characteristics of driers. Crystallization, types and characteristics of equipments, Reactors, design and bases for calculation. Simple calculation of ideal reactors, Project equations for tube and batch reactors. Calculation of nonisothermal and nonadiabatic tube reactors.

Second Year: Second Semester

SC5401- Quality Control in Sugar Factories: (2h/w)

- 1- Definitions and expressions used in chemical control and processing control.
- 2- Gravimetric methods used in chemical control.
- 3- Apparatus used in processes of chemical control and quality control.
- 4- Methods used in collection of different samples.
- 5- Chemical reagents used in chemical analysis.
- 6- General analytical methods.
- 7- Analytical methods of different products in sugar manufacture
- 8- Calculation methods used in chemical analysis in sugar manufacture.

SC5402- Research project*: (2h/w)**

SC5403- Technology of Sugar Industry(III): (4h/w)

- 1- Relationship between degree of sucrose solubility and temperature and pressure - definitions of types of different sugar solutions.
- 2- Theory of sucrose crystallization in pure and impure sugar solutions
- 3- Sucrose crystallization by concentration of sugar solutions under vacuum.
- 4- Sucrose crystallization by cooling massecute.
- 5- Boiling system in different sugar factories.
- 6- Separation of sugar crystals from mother liquor, (centrifuges), types, models and use of each centrifuge .
- 7- Sugar drying - theory of drying different types of dryers.
- 8- Carbonation of dry sugar , separation of crystal clumps, types and usage importance.
- 9- Weighing and sugar packing, degree of accuracy of weighing.
- 10- Conveyor transport of packed sugar and storage methods.
- 11- Design and calculation capacity of different instrument for each steps.

SC5404- Chemistry Laboratory* (II) (instrumentation): (4h/w)**

Selected experiments can be carried out using the following techniques:

Atomic absorption spectrometry, photometry, polarography, coulometric titration, chromatographic methods, spectrophotometric methods.

SC5405-Statistical Analysis: (2h/w)

1- Descriptive statistics:

Classifications of data - graphic presentation - central mean Measurement - measure of variation - examples using the computer.

2- Linear regression and correlation:

Scattering graph - Linear and nonlinear curve fitting for two groups of data function in two variables - prediction - linear correlation coefficient (berson) and its relation to the linear regression coefficient - meaning of linear correlation coefficient, examples using computer.

3- Distribution:

Binomial – Poisson - Normal distribution, properties and its use.

4- Estimation and Hypotheses Testings:

population “sample -parameter - Point and interval estimation - confidence interval -difference between two means of normal distributions - confidence interval around of unit

proportion, difference between two proportions - minimum and alternative hypothesis - significance level - mean hypothesis test has one difference between two means of normal distribution - unit mean hypothesis test and difference between two means - examples using computer.

Elective Courses

(Second Year - Second Semester)List (A)

SC5406-Chromatographic Analysis: (2h/w)

- 1- Nuclear magnetic Resonance spectroscopy ^1H , ^{13}C .
 - Theory.
 - Instrumentation and measurements.
 - Applications.
- 2- Mass Spectroscopy.
 - Theory.
 - Instrumentation.
 - Applications.
- 3- Gas chromatography (GC):

Types, mechanism of separation, factors influencing separation processes, Application in qualitative and quantitative analysis.
- 4- High Performance Liquid Chromatography (HPLC), mechanism of separation, factors influencing separation processes. application in qualitative and quantitative analysis.
- 5- Ion-exchange chromatography.
- 6- Exclusion chromatography.

SC5407- Quality and management: (2h/w)

- Quality processes throughout the world.
- Management principles.
- Quality management principles.
- ISO 9000 and ISO 14000 registration.
- Quality function deployment.
- Certification and communication.

SC5408- Process Control Engineering: (2h/w)

Frequency response analysis; advanced control techniques; multivariable control systems; mathematical tools for computer control systems; design of computer control systems; engineering design of industrial control applications; plant wide control, concert distributed control systems.

Elective Courses

(Second Year - Second Semester)List (B)

SC5409- Design of Industrial Waste Treatment Systems: (2h/w)

Designed to provide the student with the fundamentals of air and water pollution problems and the control technology and legislation associated with these problems.

SC5410- Corrosion Control: (2h/w)

Advanced course in engineering design for the prevention and control of corrosion in a wide range of engineering systems including: chemical and petrochemical plants, conventional and nuclear power plants; transportation systems; communications; structures. Several case studies of previous corrosion problems will be included.

SC5411- Marketing Research: (2h/w)

Examines the principles and procedures associated with the collection and analysis of relevant information in the context of solving practical marketing problems. Students have the opportunity to apply these principles at each stage of marketing research process: Problem definition, research design, data collection, data analysis, and report preparation.

SC5412- Project Economics: (2 h/w)

- 1- An overview, the role of projects in economic development.
- 2- Economic Environment.
- 3- Determinants of project efficiency and its indicators.
 - Kinds of efficiency – industry viz project, technical viz economic.
 - Determinants of efficiency.
 - Indicators of efficiency (Productivity & Profitability).
- 4- Pricing methods in theory & practice.
- 5- Demand analysis.
- 6- Project appraisal (financial and commercial studies).
- 7- Cases.