B. Sc. Chemistry/Zoology Program

Offered by

Department of Zoology

Faculty of Science

Assiut University

Assiut University
Faculty of Science
Department of Zoology

Quality Assurance and Accreditation Unit (QAAU)

University of Assiut.
Faculty of Science
Department of Zoology

Program Specification

(Year 2008 / 2009)

A- Basic Information

1- Program Title: B.Sc. in Chemistry/Zoology
2- Program Type: Single ☐ Double ☑ Multiple ☐
3- Faculty: of Science Assiut University
4- Department: of Zoology
5- Assistant Coordinator: Dr. Safaa M. Ali
6- Coordinator: Prof. Dr. Gamal H. El-Sokkary
7- External Evaluators: Prof. Dr. Gamalat Yousef Osman Dean, Science, Monofia
: Prof. Dr. Mohamed F. Al-Said Head Zoology, Sohag
8- Last date of program specifications approval: 1994/1995

B- Professional Information

1- Program Aims

-Develop a broad understanding of whole-organism biology together with a more detailed and critical understanding of selected areas in zoology with emphasize on chemical aspects.
-Create in students a range of subject-specific and generic skills appropriate to employment both within zoology and chemical fields.
-Prepare students for postgraduate work and a professional career in zoology, biochemistry and immunology.
-Develop in students the ability to apply their scientific knowledge and skills to solve practical problems related to zoology and biochemistry.
-To provide students deep knowledge in zoology and chemistry.
-To cultivate interest in zoology, particularly at the organismal level, within a caring and intellectually stimulating environment.

2- Intended Learning Outcomes (ILOs)

K-Knowledge and Understanding:

Students will have:

K1- A broad-based core-knowledge (including: botany, zoology, general chemistry, general physics, mathematics, invertebrate taxonomy, entomology, genetics, biostatistics, computer science and English).
K2- In-depth knowledge of specific subject areas (including: animal taxonomy, cell biology, histology, histochemistry, microtechniques, animal ecology, animal physiology, compartavie anatomy of vertebrates, embryology, parasitology, fish biology, animal behaviour and evolution). In addition, to the associated subject in inorganic chemistry, organic chemisstry, physical chemistry, physical and inorganic chemistry, nuclear and applied chemistry, analytical and inorganic chemistry).
K3- A working knowledge of biostatistical techniques and their application.
K4-A working knowledge of zoological and chemical terminology, nomenclature and classification.
K5- An understanding of the applicability of zoological skills and knowledge to careers.

K6-Understand physical and ecological elements and processes sustaining ecosystems, and recognize the implications of altering those components on the light of chemical characteristics of materials and ecosystems.
K7-Demonstrate knowledge and understanding in all levels of biological organisms .
K8- Evaluate different methods and techniques for generating biological information and data, and analyze and interpret these with minimal guidance.

I-Intellectual Skills

Student will be able to:

I1- Make reasoned decisions.
I2- Integrate theory and practice.
I3- Synthesize information/data from a variety of sources.
I4- Analyze and solve problems.
I5- Organize tasks into a structured form.
I6- Plan, conduct and write a report on an independent project and taking a decision.
I7- Recognize and apply concepts and paradigms to his work.
I8- Exercise independent logical thought and judgment.
I9- Tackle scientific problems with accuracy and perfection.

S-Professional Skills

Students will be able to:

S1- Carry out laboratory and/or field practical project effectively and safely.
S2- Interpret experimental observations made in laboratory and/or field correctly.
S3- Apply and critically evaluate the applications/limitations of selected research methods and analytical techniques.
S4- Recognize and apply zoological and chemical theories, concepts, principles and/or paradigms to their work.
S5- Obtain and integrate zoological and chemical evidence to formulate and test hypotheses in biological systems.
S6- Design investigations that address focused questions and interpret empirical data in an objective, critical and informative manner.
S7- Exercise independent thought and judgment.
S8- Recognize the moral and ethical issues of a particular approach and appreciate the need for ethical standards and appropriate codes of conduct.
S9- Critically analyze, synthesize, summarize and cite printed and electronic information.
S10- Carry out a health and safety risk assessment and devise a safe system of working.
S11- Collect, record, organize and/or analyze qualitative and quantitative field and laboratory data to address zoological questions.
S12- Use commercial software for the analysis, design and presentation of information and/or data.

T-General Skills

Students will be able to:

T1- Communicate scientific ideas orally and in writing.
T2- Recognize and respect the views and opinions of other team members.
T3- Reflect on individual and group performance and adjust subsequent approaches.
T4- Use library resources
T5- Manage time and negotiate effectively.
T6- Find and utilize electronic and printed information effectively.
T7- Use advanced presentation aids effectively.
T8- Identify individual and collective goals and responsibilities and perform in a manner appropriate to these roles.
T9- Negotiate effectively
T10- Make informed / justifiable decisions.
T11- Identify and work towards targets for personal, academic and career development.
T12- Develop an adaptable, flexible and effective approach to study and work.
T13- Appreciate the interdisciplinary nature of science.
T14- Manage projects.
T15- Demonstrate adequate numerical and problem solving skills appropriate to a degree-level biologist.

3- Curriculum Structure and Contents

3.a- Program duration : 4 Academic years (B.Sc)

Modes of the Attendance: Full time

3.b- Program structure

3.b.1- No. of hours per week: Lectures: 128 Lab./Exercise: 130 total: 258

3.b.2- No. of credit hours: Compulsory ☑ Elective Optional

3.b.3- No. of hours of basic sciences courses: No. 256 % 99.2

3.b.4- No. of hours of courses of social sciences and Humanities: No. 2 % 0.8

3.b.5- No. of hours of specialized courses: No. 124 % 48.1

3.b.6- No. of hours of other courses: No. 134 % 51.9

5-Program Courses

Code/ Course No.	Course Title	No. of hours/week			Year	Semester	Achieved ILOs (By No.)
		Lect.	Pract.	Exer.			
101 –B	Plant Kingdom and Morphology	3	4	-	FIRST	First	K1,I1-I9,S1-S3, S9, T1-T114
101 -Z	Animal Histology, Physiology and Introduction to Embryology	3	4	-	FIRST	First	K1, k4, I1-I9, S1-S4,S8,S9, T1-T15
101 -C	General Chemistry (i)	4	3	1	FIRST	First	K1, I1-I9, S1-S3, S9, T1-T13
105 -P	General Physics for Biology (i) (Electricity and Geometrical Opticls)	2	2	1	FIRST	First	K1, I1-I9,S1-S3, S9,T1-T13,T15
105 –M	Mathematics for Biology (i)	2	-	1	FIRST	First	K1, I1-I9, T1-T13, T15
101 -L	English Language	1	-	-	FIRST	First	K1,I3, T4, T7-T9, T12
102 –B	Plant Physiology and Anatomy	3	4	-	FIRST	Second	K1, I1-I9, S1-S3, S9, T1-T15
102 -Z	Invertebrate (Protozoa to Annelida)	3	4	-	FIRST	Second	K1, k4, I1-I9, S1-S4, S9, T1-T14
102 -C	General Chemistry (ii)	4	3	1	FIRST	Second	K1, I1-I9, S1-S3, S9, T1-T13
106 -P	General Physics for Biology (i) (Heat and properties of Matter)	2	2	1	FIRST	Second	K1, I1-I9, S1-S3, S9, T1-T13,T15
106 –M	Mathematics for Biology (i)	2	-	1	FIRST	Second	K1, I3, T4, T5, T7-T9, T12.
101 -L	English Language	1	-	-	FIRST	Second	K1, I3, T4, T7-T9, T12.
201 -B	Plant Anatomy and Phycology	4	4	-	SECOND	First	K1, I1-I9, S1-S3, S9, T1-T14
201 -Z	Invertebrate and Insects	4	4	-	SECOND	First	K1, k4, I1-I9, S9, T1-T14
251 -C	Physical, Inorganic and Analytical Chemistry	4	4	-	SECOND	First	K1, I1-I9, S1-S3, S9, T1-T13
209 –P	General Physics for Biology (ii) (Electricity and A.C.)	2	3	-	SECOND	First	K1, I1-I9, S1-S3, S9, T1-T13, T15

Code/ Course No.	Course Title	No. of hours/week			Year	Semester	Achieved ILOs (By No.)
		Lect.	Pract.	Exer.			
209 -M	Mathematics for Biology (II) Partial Differentiation and Algebra	2	-	1	SECOND	First	K1, I3, T4, T5, T7-T9, T12.
202 -B	Plant Ecology, Taxonomy and Economy	4	4	-	SECOND	Second	K1 I1-I9,S1-S3, S7, S9, S10, S11, S12,T1-T14
202 -Z	Verteberate and Genetics	4	4	-	SECOND	Second	K1, k4 I1-I9, S1-S4, S7 –S9, T1-T14
262 -C	Organic Chemistry	4	4	-	SECOND	Second	K1, K2, I1-I9, S1-S3, S7, S9, T1-T13
210 -P	General Physics for Biology (ii) (Physical Optics and Modern Physics)	2	3	-	SECOND	Second	K1 I1-I9, S1-S3, S7, S9, T1-T13, T15
210 -M	Mathematics for Biology (II) (Integration and Geometry)	2	-	1	SECOND	Second	K1, k3 I1-I9, T1-T13,T15
305-Z	Animal Taxonomy	4	3	-	THIRD	First	K2, k4, K5, k8, I1-I9, S1-S5, S7, S9, S11, S12, T1-T14
307-Z	Embryology, Cytology, Histology and Microtechnique	4	4	-	THIRD	First	K2, k4, K5,k7, k8 I1-I9, S1-S4, S7, S9, T1-T14
311 -C	Inorganic Chemistry (i)	4	4	-	THIRD	First	K2, I1-I9,S1-S3, S7, S9, T1-T13
361 -C	Organic Chemistry	4	4	-	THIRD	First	K1 I1-I9, S1-S3, S7, S9, T1-T13,T15
319 -P	Radiation and Biophysics	2	4		THIRD	First	K2, k4, k6, k7, k8 I1-I9, S1-S3, S6, S7, S9-S12, T1-T15
306 -Z	Parasitology and Malacology	2	2	-	THIRD	Second	K2, k4, K5, k7, k8 I1-I9, S1-S4, S7-S9, S11, S12, T1-T14
308 -Z	Ecology and Animal Physiology	4	5	-	THIRD	Second	K2, K5,I1-I9, S1-S3, S7, S9, T1-T13
324 -C	Physical Chemistry (ii)	4	4	-	THIRD	Second	K2, I1-I9, S3, S7, S9, S12, T1-T13,T15
364 -C	Organic Chemistry	4	4	-	THIRD	Second	K2, k8, I1-I9, S1-S3, S6, S7, S9, S11, S12,T1-T15
330 -M	Biostatistics	2	-	-	THIRD	Second	K1, k8, I1-I9, S1-S3, S7, S9, T1-T14
407 -Z	Vertebrate Comparative Anatomy and Evolution	4	4	-	FOURTH	First	K2, k4, k7, k8, I1-I9, S1-S4, S7, S9, T1-T14
409 -Z	Histology and Histochemistry	2	4	-	FOURTH	First	K2, I1-I9, S1-S3, S7, S9, T1-T13
423 -C	Physical and Inorganic Chemistry	4	4	-	FOURTH	First	k8, I1-I9, S1-S3, S7, S9, S11, S12, T1-T14
451 -C	Nuclear and Applied Chemistry	4	4	-	FOURTH	First	I1-I9, S1-S3, S7, S9, T1-T14
471-CZ	Research Project	2	-	-	FOURTH	First	K2, k4, k6, k8, I1-I9, S1-S4, S7, S9, S11, S12, T1-T14
408 -Z	Fish Biology and Special EnvIronmental Ecology	3	4	-	FOURTH	Second	K2, k4,, k7, k8, I1-I9, S1-S5, S7-S9-S12
412 -Z	Animal Physiology and Behaviour	3	4	-	FOURTH	Second	K2, I1-I9, S1-S3, S7, S9, T1-T13
452 -C	Analytical and Inorganic Chemistry	4	4	-	FOURTH	Second	I1-I9, S1-S3, S7, S9, T1-T14
462 -C	Organic Chemistry	4	4	-	FOURTH	Second	K2-k8, I1-I9, S1-S3, S7, S9, T1-T14
471-CZ	Research Project	2		-			K2, k4, k6, k8, I1-I9, S1-S4, S7, S9, S11, S12, T1-T14

6- Contents of Courses

Code/ Course No.	Course Title	Syllabus
101 -B	Plant Kingdom and Morphology	(a) Plant Kingdom (Lect. 3hr, Pract. 2hr/w). A general study of Viruses, Bacteria, Algae, Fungi, Lichens, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms, including characteristics of structure, and life cycle of each group. (b) Plant Morphologly (Lect. 1hr, Pract. 2hr/w). Seeds and germination - Morphological features of roots, stems and leaves and their modifications.
101 -Z	Animal Histology, Physiology and Introduction to Embryology	**A - Histology: (Lect .1hr, Pract .4 -hr/w) .** Ultrastructure and function of animal cell-Study of the animal tissues (epithelial, connective, muscular and nervous tissues). **B - Physiology: (Lect .1hr, Pract.-hr/w) .** Principles of animal physiology, including nutrition (food elements, digestion, absorption & metabolism) - respiration - circulation - excretion - coordination (nervous & chemical). **C - An introduction to embryology: (Lect .1hr, Pract .-hr/w) .** Early development of Amphioxus, Bufo, chick & mammals.
101 -C	General Chemistry (i)	Principles of organic Chemistry, atomic structure and bonding in organic molecules, types of chemical reagents, Class, fication and nomenclature of organic compounds.(study of aliphatic hydrocarbons and their halogen derivativcs, alcolhols, ethers, sulpur and nitrogcn organic compounds, aldehydes, Ketones and carboxylic (acids).

105 -P	General Physics for Biology (i) (Electricity and Geometrical Opticls)	**(Electricity & Geometrical** Optics) , I st Term (Lec. 2hrs + Pract. 2hrs + Tut. lhr / w) I- Electricity: Elements of Electric Circuits; llirchhoffs Laws and Its Applications; Effects of Electric Current; AJtemating Current; AJtemating Current Circuits. ii- Geometrical Optics: Reflection and Refiaction at Plane Surfaces; Prisms; Reflection and Refiaction at Spherical Surfaces; ThbJ and Thick Lenses; Aberrations: Monochromatic aberrations, Chromatic Aberrations; Optical Instruments. iii- Practical Physics: Twelve Experiments Related to the Above Theoretical Topics.
105 -M	Mathematics for Biology (i)	a) Differential Calculus : The function and continuity - limits - Derivatives of first order for algebraic and transcendental function application to differentiation (Extreme values - Minimum and maximum values of a function - Sketch of the graph of function) b) Algebra : Binomial theorem with any exponent - Partial Fractions - Determinants and matrices and the consistency - Complex numbers
101 -L	English Language	
102 -B	Plant Physiology and Anatomy	(a) Plant Physiology (Lect. 2hr, Pract. 2hr/w). Plant water relationships-physical solutins in living systems -colloids, imbibition and diffusion – osmosis – permeability - absorption of water - ascent of sap transpiration - mineral nutrition – enzymes – photosynthesis - metabolism -plant pigments – respiration - growth. (b) Plant Anatomy (Lect. 1hr, Pract. 2hr/w). Studies on plant cell contents - plant tissues - anatomical structure of primary plant organs - relationships between plant structure and environmental conditions.
102 -Z	Invertebrate (Protozoa to Annelida)	Simple explanation of the classification of animal kingdom into the main phyla. Explanation of the characters of each of the phyla: Protozoa, Porifera, Cnidaria, Platyhelminthes, Aschelminthes, and Annelida. Description of the functional morphology of examples belonging to each of these phyla and their classes.

102 -C	General Chemistry (ii)	a) Physical chemistry: States of matter (gases liquids and solids). thermo- chemistry - introduction to thermodynamics - collegative properties of solutions - chemical and ionic equilibria and applications - electrolytic solutions and electrical conductance - introduction to electrochemistry - introduction to phase rule - colloids - surface chemistry and catalysis. b) Practical: Simple experiments in quantitative volumetric analysis.
106 -P	General Physics for Biology (i) (Heat and properties of Matter)	**(Heat and Properties of** Matter) . 2nd Term (Lec. 2hrs + Pract. 2hrs + Tut, I hr /w) i- Heat: Heat Transfer; Stable Heat Conduction; Thermal Radiation; Heat and Work; The First Law of Thermodynamics. ii- Properties of Matter: Elasticity; Elasticity of Bones Under Tension and Pressure; Viscosity of Fluids; Viscosity ofBlood; Laminar Flow and turbulent Flow; Surface Tension and Its Applications in Lungs. iii- Practical Physics: Twelve Experiments Related to the Above Theoretical Topics.
106 -M	Mathematics for Biology (i)	a) Integral calculus : Integral methods - Definite Integral b) Geometry : Conic sections - Vectors in the plane and space
101 -L	English Language	
201 -B	Plant Anatomy and Phycology	(a) Plant Anatomy (Lect. 2hr, Pract. 2hr/w). Detailed study of meristems and classification and theoreis of differentiation-permanent tissues - structure and evolution of steles - anatomical structure of primary plant organs - different types of secondary thickness in plants – cork –lenticles - tyloses - sap and heart wood - leaf gaps and traces. (b) Phycology (Lect. 2hr, Pract. 2hr/w). An introductory study to algae - algal ecological habitats - studies on some representative algal species and their life cycles - evolutionary features of some algal genera and sepcies.
201 -Z	Invertebrate and Insects	**A - Invertebrates: (Lect .2hr, Pract .2hr/w) .** A study of the characters of the phyla: Arthropoda, Mollusca and Echinodermata. Description of the functional morphology of examples of these phyla to show the characters of the classes of each phylum. **B - Insects: (Lect .2hr, Pract .2hr/w) .** A study of the fundamentals of Entomology including external features, internal anatomy. Study of some important orders of the class Insecta.

251 -C	Physical, Inorganic and Analytical Chemistry	a) Physical chemistry : Thermodynamics (first law of thermodynamics and its applications . Numerical values for different functions in isothermal and adiabtic processes. efficiency of transformation of heat energy to work - second law of thermodynamics - entropy and another statement of the second law of thermodynamics - free energy function - applications of the second law of thermodynamics). kinetics of chemical reactions (rate equations - order of reaction and molecularity - rate equations for different orders- deteremination of order of reaction-Arrhenius equation - rate equations for reversible, consecutive, and parallel reactions . b) Inorganic chemistry (i) : General properties of (S&P)block elements, atomic and ionic radius - ionization potentials - electron affinity and electronegativity - vertical horizontal and diagonal relationships in the periodic table - hydrogen and hydrides chemistry of groups (I-Vll), types of oxides - hydrogen peroxide c) Analytical chemistry: Volumetric analysis - complexometric titrations - gravimetric analysis - potentiometric and conductometric titrations .
209 -P	General Physics for Biology (ii) (Electricity and A.C.)	(Electricity and AJtemating Current) I st. Term (Lec. 2hrs + Pract. 3hrs / w) Conduction Through Gases; Cathode Ray; Cathode Ray Oscilloscope; Motion of Charged Particles in Electric and Magnetic Fields; Electron Microscope;; Mass Spectrograph; AJtemating Current Circuits and their Applications. Practical Physics: Twelve Experiments Related to the Above Theoretical Topics. '
209 -M	Mathematics for Biology (II) Partial Differentiation and Algebra	- Functions of several variables and Partial derivatives- Differential equation of first order/degree and its application.-The fundamental theorem in algebra- interpolation- curve fitting.

202 -B	Plant Ecology, Taxonomy and Economy	(a) Plant Ecology (Lect. 2hr, Pract. 2hr/w). Climate and plant - effect of climatic factors on growth, biological activities and geographical distribution of plants. These factors include the effect of solar radiation, temperature, light, atmospheric water, wind and microorganisms-Introduction to the ecological and natural systems and their effects on plants. (b) Taxonomy of Flowering Plants (Lect. 1hr, Pract. 2hr/w). General introduction - flower structure - types of inflorescences and fruits -systems of classification - study of representative families of angiosperms. (c) Economic Botany (Lect. 1hr.) Some plant products of economic values - sugars, starch, fats, oils, vitamins - medicinal plants - fibres - paper industry - some microbiological industries.
202 -Z	Verteberate and Genetics	**A - Vertebrates: (Lect . 3hr, Pract .4hr/w) .** The main principles of the classification of phylum Chordata, specially the subphylum Vertebrata. Morphological studies of examples of the different classes of this subphylum. **B - Genetics: (Lect .1hr, Pract .-hr/w) .** a) Mendelian genetics including the principles of Mendelian genetics and its application-genetics and the chromosomes with their associations. b) Molecular genetics including the chemistry of genes and their functions - genetic mutations. c) An introduction to population genetics.
262 -C	Organic Chemistry	a) Stereochemistry: Introduction on optical and geometrical isomerism. b) Chemistry of aromatic: Aromaticity, the ehemistry of benzene and its derivatives. c) Chemical reaction mechanisms: Type of chemical reactions: addition reactions, elimination reactions, Nucleophilic substitution reactions, chemistry of free radicals and concerted reactions).

210 -P	General Physics for Biology (ii) (Physical Optics and Modern Physics)	(Physical Optics and Modem Physics) 2nd Term (Lec. 2hrs + Pract. 3hrs. / w) (I) Physical Optics: Interference; Difkaction (Fresnel and Fraunhofer); Difkaction Grating;. X-ray Difkaction; Polarization by Reflection and Double Refiaction; Spectrophotometers. (ii)Modem Physics: Planck's Discovery; Photoelectflc Effect; Electromagnetic Waves; Interactionofe,m,w, with Different Materials; X-rays; Nuclear Radiations and their Effects in Medicine and Biology; Radiation Detectors and Protection. Practical Physics; Twelve Experiments Related to the Above Theoretical Topics.
210 M	Mathematics for Biology (II) (Integration and Geometry)	- Application in definite integral- Multiple Integral-Approximate Integration- The geometry of lines and planes in spece- Quadratic surfaces.
305-Z	Animal Taxonomy	**Animal Taxonomy: (Lect .4hr, Pract .3hr/w) .** Basis of animal taxonomy and its importance with reference to the characters of each of the different phyla and their classes taking into consideration the relationships between them and the suitable taxonomic position of each, supporting the study with examples.
307-Z	Embryology, Cytology, Histology and Microtechniq ue	**Embryology, Cytology, Histology and microtechnique (Lect .4hr, Pract. 4hr/w) .** **A – Embryology:(Lect.2hr,Pract.2hr/w)** Study of differentiation of embryonic layers and the systems arising from each in different classes of vertebrates. **B - Cytology and Histology:(Lect.2hr,Pract.2hr/w)** tudy of structure and function of the animal cell and its organelles, cell cycle and cell division, study of different animal tissues. **C - Microtechnique:** Methods and tools used in the study of the animal cell and tissues, light and electron microscopic studies of different animal cells and tissues.

311 -C	Inorganic Chemistry (i)	**Inorganic chemistry (i) (Lect. 4hr , Pract. 4hr/W) .** a) Transition elements : General properties of the transition elements - reactivity of elements - Ionization energies - colours and magnetic properties 0-catalylic properties - ability toward complex formation - chemistry of groups of transition elements. b) Coordination compounds (i) : Coordination compounds and double salts - Werner theory- nomenclature of coordination compounds - effective atomic number - coordination numbers and geometrical structure.tetra and hexa coordination compounds. c) Industrial chemistry : Important applications of inorganic compounds - application of the phase rule on the iron and steel industry - industry of the surface protection study of water pollution and protection of enviroment technology of silicates - industry of inorganic and fertilizers.
361 -C	Organic Chemistry	**Organic Chemisstry(ii) (Lect. 4hr, Pract. 6hr) .** a) Spectroscopy (i) Infrared and Ultraviolet spectroscopy b) Named Reactions . c) Petroleum and petrochemicals. d) Alicyclic compounds and € -dicarbonyl compounds.
319 -P	Radiation and Biophysics	**Radiation Physics and Biophysics** lst. Term (Lec. 2hrs + Pract. 4hrs / w) a- Radiation Physics: Principles of Radiation Decay; Natural Radioactive Transformations and Radioactive Series; Activity and Units and their relation with the Absorbed Dose Units; Characteristics of a-and fl- particles and their interaction witl.i Living Organisms. b- Biophysics: Natural Radioactive Sources; Chemical and Biological Effects of Radiations on Living Bodies; Radiation Doses Radiation Protection; Other Radiation Sources. Practical Physics: Twelve Experiments Related to the Above Theoretical Topics. .
306 -Z	Parasitology and Malacology	**Parasitology and Malacology (Lect .2hr, Pract .2hr/w) .** **A - Parasitology: (Lect .1hr, Pract .1hr/w) .** Explanation of parasitism, its types, the functional morphology and life cycle of variable examples of parasites infecting man and his important animals, methods of parasite control. **B - Malacology: (Lect .1hr, Pract .1hr/w) .** Medical and economic importance of molluscs and their role in transmitting parasites belonging to Platyhelminthes and Aschelminthes, methods of the invasion of parasites into molluscan hosts and the interaction between them, methods of control of molluscan hosts.

308 -Z	Ecology and Animal Physiology	**Ecology and Animal Physiology (Lect .4hr, Pract .5hr/w) .** **A - Ecology: (Lect .2hr, Pract .1hr/w) .** An introduction to ecology, study of important physical ecological factors and their effects on living organisms, study of organisms of different phyla in an ecosystem and the interrelationships between them, living communities and their arrangement and evolution, energy in the ecosystem. **B - Animal Physiology: (Lect .2hr, Pract .4hr/w) .** Study of the different manifestations of life (Nutrition, Excretion, blood circulation, lymph and coordinating systems).
324 -C	Physical Chemistry (ii)	**Physical chemistry (ii). (Quantum chemistry, Molecular spectroscopy and Electrochemistry (i)) (Lect . 4hr, Pract. 4hr/W) .** a) Quantum chemistry : Introduction to wave mechanics - radiation of black body - Photoelectric effect - the Bohr theory of hydrogen atom - operators - Schrodinger equation (Solution of Schrodinger equation for a free particle and a particle in a box - quantum mechanics and atomic structure concepts and parameters)- Schrodinger equation for the hydrogen atom - the radial factor and the angular distribution of orbitals - the molecular orbital theory and valancy orbitals with a comparative study . b) Molecular spectroscopy : Types and patterns of free energies of gas molecules - experiments and theoretical treatment for studies on vibrational, rotational, raman and electronic spectra - spectral analysis using NMR and ESR c) Electrochemistry (i) : Types of electrochemical cells - methods for EMF measurements - the relation between electrode potential and activities - redox potentials - the thrmodynamic function in relation to EMF measurements .
364 -C	Organic Chemistry	**Organic Chemistry (ii) (Lect. 4hr, Pract. 6hr) .** a) Chemistry of hetrocyclic compound(i) containing one hetero-atom. b) Polynuclear compounds. c) Chemistry of biomolecules (i) Carbohydrates, amino acids and proteins. d) Chemistry of biomolcules (ii), nucleic acids. and enzymes .
330 -M	Biostatistics	**Biostatistics (2h/w)** Introduction in descriptive statistics - The concept of probability - Some important theorems on probability - The binomial distribution - The Poisson distribution - The normal distribution - Confidence intervals - Tests of hypotheses and significance t-test - The Chi square test - F test - Curve fitting - Regression and correlation .

407 -Z	Vertebrate Comparative Anatomy and Evolution	**(407Z) Vertebrate comparative anatomy and evolution (Lect .4hr, Pract .4hr/w) .** **A - Vertebrate comparative anatomy: (Lect .3hr, Pract .4hr/w) .** Comparative anatomical study of different vertebrate systems with reference to their functions. **B - Evolution: (Lect . 1hr, Pract .-hr/w) .** Introductory idea of evolution and its origin, study of evidence of occurrence of evolution, theories of evolution, different types of evolution, evolution and adaptation, future of evolution
409 -Z	Histology and Histochemistry	**Histology and Histochemistry (Lect .2hr, Pract .4hr/w) .** Comparative study of different types of animal tissues. Study of chemical components (carbohydrates, proteins, fats, enzymes, pigments, minerals, ... etc.) in different animial cells and tissues including the theoretical bases of different cytochemical and histochemical reactions.
423 -C	Physical and Inorganic Chemistry	**Physical and inorganic chemistry. (Lect. 4hr, Pract. 4hr/W) .** a) Kinetic molecular theory of gases : The kinetic molecular gas model-numarical values of molecular velocities and their distribution in three diminsions- the molecular gas collisions and the mean free path types of thermal energies and the method of their distribution for the ideal gase . b) Surface chemistry : surface tension monomolecular surface film between liquid-liquid interface-study of the contact between liquid and solid-adsorption on the soild surfaces-types of adsorption isotherms- adsorption equations of the gas on the soild surfaces - adsorption from solutions c) Colloids : Classification of colloidal systems preparation of colloidal solutions - general properties - electrical , optical and kinetice of colloidal solutions - gells study and applications of surfactants and their properties. d) Chemistry of inner transition elements : series of lanthanide elements (electronic structure, oxidation states , methods of separations) - series of actinides elements (methods of separations, oxidation states ,chemistry of Th(IV)and uranium in aqueous solution.
451 -C	Nuclear and Applied Chemistry	**Nuclear and Applied chemistry. (Lect. 4hr,Pract. 4hr/W).** a) Organic chemical industries - dyes and fibers. b) Nuclear and radiation chemistry : radioactivity - nature of radioactive rays and its types - the kinetics of radioactive decay and growth-structure of nuclei - the nuclear potential - nuclear reactions and nuclear reactors - nuclear fission.

471-CZ	Research Project	**An essay or a research (Lect .2hr, Pract.4hr/w) .** Selected subjects according to available branches of chemistry and zoology. **Dissertation or research project (Lect. 2hr/W) .** Selected topics according to the fields of research in chemistry and Zoology departments.
408 -Z	Fish Biology and Special EnvIronmental Ecology	**Fish Biology and Special Environments (Lect .3hr, Pract .4hr/w) .** **A - Fish Biology: (Lect .2hr, Pract .2hr/w) .** Methods of identification of bony fishes, brief idea of bony fishes classification, food ; and feeding habits and reproduction in bony fishes. Study of chemical and physical factors needed for rearing fishes, and their application in fish culture in fresh water. **B - Special Environments (Lect .1hr, Pract .2hr/w) .** Soil as an environment harboring living communities, structure of soil and its layers, definition of soil animals and methods used for their classification - soil community, methods of extraction of soil animals and the ecological factors affecting their distribution.
412 -Z	Animal Physiology and Behaviour	**Animal Physiology and Behaviour (Lect. 3hr, Pract .4hr/w) .** **A - Animal Physiology: (Lect .2hr, Pract .4hr/w) .** Study of nervous and chemical coordination in animals. Study of reproductive physiology. **B - Behaviour: (Lect. 1hr, Pract. -hr/w) .** Study of fundamental animal behaviour including instinct, educational and social behaviour, communications between animals and between animals and humans.
452 -C	Analytical and Inorganic Chemistry	**Analytical and Inorganic chemistry. (Lect. 4hr, Pract. 4hr/W) .** a) Coordination compounds theories of bonding in transition metal complexes crystal field theory (spletting of d orbitals uses and applications) ligand field theory - applications covalent bonding and molecular orbital theory symmetry in complexes deformation and Jhan-Teller effect -stability and spectra of complexes . b) Structural inorganic chemistry : Structural formula of inorganic compounds- form geometrical and topological limitations on the structures of molecules and crystals - structures in solid state - structural changes on melting in liquid states, on boiling , on sublimation - classification of crystals - relations between crystal structures. c) Instrumental methods of chemical analysis : Spectrophotometric methods electroanalytical , polarographic , chromatographic potentiometric and conductometric methods of analysis.

462 -C	Organic Chemistry	**Organic Chcmistry (Lect. 4hr, Pract. 4hr) .** a) Spectroscopy (ii) Nuclear magnetic resonance and mass spectrometry. b) Chromatographic analysis. c) Chemotherapy. d) Natural Products.
471-CZ	Research Project	**An essay or a research (Lect .2hr, Pract.4hr/w) .** Selected subjects according to available branches of chemistry and zoology. **Dissertation or research project (Lect. 2hr/W) .** Selected topics according to the fields of research in chemistry and Zoology departments.

7- Program Admission Requirements

According to bylaw of the faculty of science, Assiut University, the program starts in the third academic year with the following requirements:

a. Students passing exams of the first and second years of the Biological Sciences Group (Article 5).
b. Students must pass the second year with a grade "Good", at least, as a general grade (Article 6).

8- Regulations for progression and program completion

a-According to bylaw of the faculty of science, Assiut University, regulation for progression and program completion, to gain the award of the programm are:

b-If the student has failed in the first level for two years, he must leave the faculty.
c-Attendance 75%, at least of the lectures, practical sessions and exercises (Article 9).
d. If the student of the second, third and fourth levels has failed for two years in the level, he will be attended as external not regular student.
e. Completion of 3 weeks training during the Summer vacation, after passing the third year exams, at any of the research, industry, production, and service centers (Article 8).
f. Passing the program course exams.
g. The following grading system is applied:

The grade	% of the total marks
Excellent	85-100
Very good	75 to <85
Good	65 to <75
Pass	60 to <65
Fail	<60

9-Student Assessment (Methods and rules for student assessment)

Method (tool)	Weighting	Intended leaning outcomes assessed (By No.)
1- Final written exam	**60%**	
2- Practical Exam	**30%**	
3- Class work & Mid-term exam	**10%**	

10- Program Evaluation

Evaluator	Tool	Sample
1- Senior students	Questionnaire	
2- Alumni	Questionnaire	
3- Stakeholders (Employers)	Questionnaire	
4-External Evaluator(s) (External Examiner(s)		
5- Other		