Revised Course Outlines for Session 2025 & Onwards

SEMESTER-1

ES-101 INTRODUCTION TO ENVIRONMENTAL SCIENCE

Course Outline:

Basic principles: about convergence of ecology with economics and sociology to evolve as environmental science, its nature, history, scope and the contribution to society. Environmental aspects: physic-chemical, biological, socio-economic, socio-cultural, moral and ethical, and philosophical thinking. Environmental problems: local, regional and global level. Environmental challenges: Sustainability of resources for development: efficiency of energy and water resources, current and future trends in growth and resultant environmental pollution, poverty and resource depletion, development in industry, agriculture and urbanization.

CY-142 PHYSICAL AND ANALYTICAL CHEMISTRY

Course Outline:

Dalton's law, Henry's law, Raoult's law, Relative volatility, Colligative properties, Electrochemistry, including fuel cells, Colloidal chemistry, reaction kinetics and equilibrium, introduction to instrumental techniques involving (a) Potentiometery (b) pH-metery (c) Liquid solid chromatography (d) High performance liquid chromatography (e) Ion exchange chromatography (f) Gas chromatography (g) plane Chromatography (h) Spectroscopy, basics of spectroscopy (i) IR spectroscopy (j)UV and visible spectroscopy.

CY-142L PHYSICAL AND ANALYTICAL CHEMISTRY

To determine the properties of liquids through stalagmometer, viscometer, refractometer, polarimeter, charomatographic experiments including paper charomatography, TLC, IR and UV studies of various samples.

MA-110 BASIC MATHEMATICS

Course Outline:

Complex Numbers, Properties of complex numbers. Conjugates and modulus. Geometrical representation of complex numbers a+ ib. Roots of a quadratic equation (real, distinct, equal and imaginary roots). Formation of quadratic equation when the roots are given. Properties of cube root of unity; ω, ω^2, $1+ \omega + \omega^2 = 0$. Properties, sum, difference and multiplication of matrices. Cramer's rule. Solution of linear equations of three unknowns. Properties: addition,

subtraction and multiplication of determinants. Sequence and series. Arithmetic progression, Standard forms of an A. P. Arithmetic means, Geometric progression and Standard forms of a G. P. Sum of Infinite geometric series. Geometric means, Harmonic progression, Harmonic means. Relation between H.M., A.M. and G.M. Expansion of type $(a+b)^n$ for positive integer of 'n'. Use of the general term and determine the middle term or terms of the expansion. Resolve into partial fractions, Proper and improper fraction. One-one function, Onto function, Even function, Odd function, Exponential function, Trigonometric function, Logarithmic function. Understand the definition of radians and use the relationship between radians and degrees. Basic functions e.g. sine, cosine, tangent etc. relation between them. Trigonometric identities, sum and difference formulae, multiple angle formulae. Express type $\{a(\sin\theta) + b(\cos\theta)\}$ into $R\sin(\theta +- \varphi)$ etc. Inverse functions, Limits: Basic concepts, Limit of form $\{(\sin\theta)/\theta\} = I$; when θ tends to zero. Exponent functions and type a^x etc. Differentiation of χ^n product and quotient formula. Trigonometric, exponents and logarithmic functions. Differentiation of implicit function, parametric function. Higher order Derivatives, Applications of differentiations. Minima and maxima. Tangent and normal velocity and acceleration. Rate of reaction. Basic Integration. Integrals of sum of powers of 'χ'. Trigonometric, exponent and logarithmic functions. Integration by parts: e.g $\chi\sin\chi$, χe^{χ} and $\log\chi$ etc. Substitution method, Lines, find length, mid-point, gradient of line segment, given the coordinates of end points. Different forms of equation of a line. Angle between two lines, distance of a point from a line.

HU-111L COMMUNICATION SKILLS

Course Outline:

Introduction to Communication Skills, Study Skills, Components of Communication, Non-Verbal Communication, Functional English, Assessment week, Public Speaking, Formal Presentations, Resume/CV Writing, Interview Skills, Formal Presentations

ES-109 BASICS OF ENVIRONMENTAL POLLUTION

Course Outline:
Environmental Pollution, sources, types and causes. Types of pollutants: Physical, chemical and biological; Characteristics of domestic & industrial effluents; Effects of Pollutants on human & other living organisms; Industrial and Municipal Solid Waste. Principles of Waste Management & Disposal; Fate of pollutants; Factors affecting movement of pollutants in soil, air and water. Pollution Control Strategies; Environmental Laws: Pollutants Guidelines; International Protocols; Case Studies.

CSC-100-APPLICATION OF INFORMATION AND COMMUNICATION TECHNOLOGIES

Course Outline:
Introduction to Computer Systems: Basic Definitions, Computer and Communication Technology, The applications of ICT - particularly for Engineers.
Basic Operations and Components of a Generic Computer System: Basic operations: Input, Processing, Output, Storage, Basic components: Hardware, Software, Data, Users, Types of storage devices
. **Processing Data:** Transforming data into information, How computers represent and process

data, Processing Devices, CPU architectures.

Internet Basics: The Internet, The Internet and the World Wide Web- browsers, HTML, URLs/ How DNS works, Email and other programs.

Introduction to Embedded Systems: What is an Embedded System**,** Applications**,** Components**,** Programming Languages**,** Popular Development Platforms**,** Programming Languages.

Networking Basics: Uses of networks, Common types of networks (LAN, WAN, MAN etc.), Introduction to OSI Model, Future of Networks. Database Management: Hierarchy of Data, Maintaining Data, Database Management Systems. Protecting your privacy, your computer and your data: Basic Security Concepts, Threats to users, Threats to hardware, Threats to Data. ICT Applications: Computer controlled system, Robotics, Expert Systems, Computer aided manufacturing systems, Autonomous Vehicles, Management Information system (LMS, School Management System), Bioinformatics, Health care applications, Telemedicine and online health consultations, Digital Identity, Cyberbullying, Online harassment. Future Trends in ICT

CSC-100L APPLICATION OF INFORMATION AND COMMUNICATION TECHNOLOGIES

Computer Components

Use MS-WORD:

- To write Application to the chairman
- To write Paragraph on first day fooling

Use MS-WORD:

- To Design and create three folds pamphlet
- To Create Bio-data form
- To Create a Poster

Use MS-WORD:

- To make kindergarten games
- To Create Lab Manual for ICS

Use MS-WORD:

- Explorer Review tab in MS word
- Track changes into your MS word Report

Do MS Excel Assignments

MS Excel Layout and Description

Orientation of Power point

Choose and Create: Animated story

Create the Truth tables of OR, AND & XOR

Develop the solar system by animation

Lab Project: Group members introduction

Introduction to HTML

Lab Project I

Inter Department Research And Communication

Introduction to Latex

Introduction to NetBeans

Introduction to GitHub
Introduction to data management tools
Introduction to Video Animation
Computer Graphics
Lab Project II

MGT 102 SOCIOLOGY

Course Outline:

- Nature, scope and subject matter of Sociology
- Brief historical development of Sociology
- Society and community
- Relationship with other social Sciences
- Social groups
- Structure and function of socialinstitutions

SEMESTER-2

ES-103 INTRODUCTION TO EARTH SCIENCES

Course Outline:

Major components of Earth Systems, Geologic Time and processes, Geology as an historical science, scientific methods and study of Earth's evolving systems. Earth Systems, Rock cycle, the Biosphere–Biogeography, Energy relationships, biogeochemical cycles. Sedimentary rocks and fossils, processes of weathering, Biogenic sedimentary rocks, Chemical sedimentary rocks, Marine environments, Coral Reefs, Continental Shelves. Terrestrial Environments, Time and Stratigraphy: Introduction, Relative ages, Absolute ages, Evolution of Geologic time scale, why sea level is so important. Plate tectonics, structure of earth, hypothesis of continental drift, The Dynamic Earth and Natural Hazards: Earth Quake and Volcanoes, Land instability, Weather Hazards, Fires and Costal Hazards, Humans and the Environment.

ES-103L INTRODUCTION TO EARTH SCIENCES

The lab work would primarily deal with the study of the rocks and soil compositions, marine life, weather changes and their effects on environment.

MA-123 CALCULUS

Course Outlines:

- A review of differentiation: Geometrical interpretation of a derivative; Infinitesimal; Differential coefficient; Derivatives of higher order; Indeterminate forms and L. Hopital's rule; Asymptotes; Curvature; Approximation and error estimates.
- Further techniques of Integration; Integration by reduction formula; Fundamental

Theorem of Integral Calculus; Definite integral and its properties ; Area enclosed between curves; Arc length; Volume of a solid; Volume of a solid of revolution; Area of surface of revolution; Moments; Centroids.

- Improper Integrals; Infinite series.

IS-102 ISLAMIC STUDIES

For all undergraduate programs of UET in First Year

1. The Holy Quran

a. Significance of the Holy Quran
b. topics of the Holy Quran
c. Textual Study of Sura Al-Hujurat (Complete)
(Meanings of Arabic text, translation & explanation)

Focus: Impact of the teachings and commands mentioned in Sura Al-Hujurat on human life.
Main points of discussion

- Commands of Allah regarding meeting with the Holy Prophet peace be upon him.
- Reports from wicked person to be tested.
- Brotherhood, equality, effort to compose the quarrels of groups and reconciliation between them.
- Elimination of social evils such as to laugh at people in contempt, calling others by offensive nick names, suspicion and back biting.
- All people (mankind) are one and the most righteous gets most honour before Allah.
- Qualities of believers.
- Knowledge of Allah about the secrets of the heavens and the earth and out actions.

d) Textual study of Surah Al-Maida (Verse:1 to 6)
(Meaning of Arabic text, translation & explanation)

Focus: Impact of the teachings and commands mentioned in Sura Al- Maida on human life.
Main Points of Discussion:

- Stress on fulfillment of uqud (obligations)
- Concept of halal (lawful) and haram (forbidden) in Islam
- Halal and haram animals and food
- Symbols of Allah Almighty
- Emphasis on helping one another in righteousness and piety
- Rules of hunting the animals for food.
- Social relationship with non-Muslims
- Relationship between Muslims and Ahl Al-Kitab (people of the Book)
- Rules of purity and cleanliness

e) Textual Study of Sura Al-Fur'qan: verses: 63 to77, Al-Mominoon 1-11.
(Meaning of Arabic text, translation & explanation)

Focus: Impact of the teachings and commands mentioned in Sura Al-Fur'qan and al-Muminoon on human life.
Main Points of discussion: Characteristics of Ibad-ur-Rehman (Slaves of Allah) and true believers.

2) Al-Hadith

a) The need & Importance of Hadith
b) Textual study of Hadith: Arbaeen-e-Navavi by Imam Nawawi, Hadith: 1 to 42
(Meanings of Arabic text, translations and explanation)

Focus: Impact of teaching and commands mentioned in Ahadith on human life.

Main points of discussion:

- Importance of intention (Niyya) in human actions
- Islam, Iman (belief), Ihsan (excellence) and the Hour.
- Rejection of Innovation (Al-Bid'ah) in religion (Din)
- Lawful, unlawful and doubtful matters
- Sincerity to Allah, his books, his messengers, leaders of the Muslims and common people
- Protection of lives and property of people
- Obedience of the Holy Prophet peace be upon him
- Importance of lawful food, drink, clothing and nourishing
- True believer is who likes for his brother what he likes for himself.
- Honour of the blood of Muslims and others
- Respect of neighbours and guests
- Importance of good talk and silence
- Prohibition to become angry and furious
- Ihsan (excellence) with regards to everything
- Good behavior towards people
- All kinds of expectation, help and benefit from Allah
- Importance of modesty (Al-Haya)
- To stand firm on Islam
- A guideline for a Muslim
- Obligatory deeds, Charity and minor acts
- Proof and Oath
- Islamic brotherhood
- Pardoning of mistakes and forgetfulness

3) The study of articles of faith & pillars of Islam and Jihad.

Focus: Impact of basic articles of faith, pillars of Islam and Jihad on human life.

Main points of discussion

a) Six articles of faith.
b) Pillars of Islam

1. **Shahada** (Witness) Importance and philosophy of witness that no God but Allah and and Muhammad (peace be upon him) is His Messenger.
   Tawheed: Fundamentals and types of Tawheed, Al-Baqarah 284-286.
   Prophet-hood and Finality of Prophet- hood, Al-Ahzab6,21,40,56,58
2. **Salat** (Prayer) Imposition of prayer, orders and significance.
3. **Saum** (Fasting) Meaning of Fasting obligation of Fasting, significance, disbursement, phy and spiritual advantages.
4. **Zakat:** The Economic system of Islam, Importance of Zakat, Prohibition of Riba (Inter Comparison between Islamic, Economic system and socialism, Capitalism & Communism.
5. **Hajj:** Imposition of Hajj, commands and rites of Hajj, financial social and spiritual advantage of Hajj.

c) Jihad (Striving in the cause of Allah): Importance, significance and its kinds.

4-Seerah-Tun-Nabi ﷺ

Focus: Impact of the life of the Holy Prophet peace be upon him on human life.
Main points of discussion:

a. Life of the Holy Prophet (Peace be upon him) at Makkah and Madina.
b. The Holy Prophet (Peace be upon him) as a Perfect Man.
c. Muhammadan Revolution.

5) Islam and Modern Science

Focus: Impact of the teaching regarding Modern Science on human life.
Main Points of discussion:

- The Holy Quran as a guide for the modern scientific development, Surah Al-Baqra: verse 164 Aal-e-Imran verses 190-191.
- Importance of science education in the modern age.
- Introduction of Muslim Scientists, contribution of Muslim Scholars towards science.

6) Islamic Ethics

Focus: Impact of the ethics on human life.
Definition, importance and significance of Ethics.
Concept of Ethics in the light of Holy Quran

Al-Baqra: 83, 169	Al-Ana'am: 151, 152, 153	Al-Tauba: 7
Yunus: 36,	Hood: 18	Al-Nah'l:112
Al-Mutaffifeen: 1,2,3		

Main points of discussion:

- Kindness with parents, kindred, orphans and needy people.
- Fair speaking to the people
- Refrain from evil and shameful deeds
- Abstain from killing any person except by way of law
- Security of the orphan's property
- Full justice in measure and weight
- Prevention from inventing a lie
- Fraud and its bad effects.

Moral values in the light of Hadith
Bulugh-ul-Maram, Kitab-ul-Jamae, Babul Tarheeb Min Msav-al-Akhlaq
Ahadith No. 3, 4, 7, 14, 17
Main points of discussion:

- To control anger
- Oppression is darkness
- Telling a lie is sign of hypocracy
- Backbiting

Ethics and character building in the light of Seerah
Ethical behavior of the Holy Prophet (PBUH)
Significance of moral values

(i) Truth	(ii) Honesty	(iii) Taqwa
(iv) Brotherhood	(v) Patience	

Note: Ethics is an alternative subject for non-Muslim students.
Note: The Medium of Instruction is urdu / English

PHY-113 APPLIED PHYSICS

Course Outline:

Temperature, The Zeroth Law of thermodynamics, Measuring Temperature, The Celsius and Fahrenheit Scales, Thermal Expansion, Temperature and Heat, The absorption of heat by solids and liquids, The First Law of Thermodynamics, Some Special cases of the First Law of Thermodynamics, Heat transfer Mechanisms. Ideal Gases, Translational Kinetic Energy. Mean free Path, The distribution of molecular speeds, The molar specific heats of an ideal gas. Irreversible processes and Entropy, Change in Entropy, The Second Law of Thermodynamics. Magnetism, Magnetic field, Magnetic field lines and Magnetic Flux, Motion of charged particles in a magnetic field, Hall Effect, Magnetic force on a current carrying wire. Calculating the magnetic field due to a current, Force between two Parallel Currents, Ampere's Law, Solenoids and Toroids, A current carrying Coil as magnetic dipole. Induced Magnetic fields, Displacement current, Maxwell's Equations. Some properties of atoms, Electron Spin, Angular momenta and magnetic dipole moments, The Stern-Gerlach experiment, The Pauli Exclusion principle, X Rays and the Ordering of Elements, Lasers and Laser Light. Discovering Nucleus, Radioactive Decay, Half Life, Mean Life, Radioactive Dating

PHY-113L APPLIED PHYSICS

Practical knowledge based on thermodynamic processes, magnetic properties of materials, Measurement of magnetic and induced dipole, linear and angular momentum and atomic phenomenon involving light.

ES-102 ENVIRONMENTAL BIOCHEMISTRY

Course Outline:

What is environmental biochemistry? Basis of life, origin of organics, photosynthesis process in plants, Identifying characteristics of living matter, the cells and bio-molecules, carbohydrates, protein, Lipids, enzymes. Metabolism in environmental biochemistry, digestion, metabolism of fat and carbohydrates. Pollutants, microbial metabolism of pollutants with emphasis on elucidation of metabolites and critical metabolic reactions. Toxicants and their pathways into ecosystem. Managing water quality and air resources, Radiations from sunlight, protection from radiations and their harmful effects on living organisms.

ES-102L ENVIRONMENTAL BIOCHEMISTRY

Isolation and detection of various biomolecules like carbohydrates, proteins,

IS-109L/IS-212L FEHM-E-QURAN/SOCIAL ETHICS I

Weeks	Lectures (1.5 hrs)	Units	Lessons	Assignments/ Home Task	Linguistic Rules
1	1	1	1-8	Writing the meaning of Quranic words Lesson 1-8	Proper Noun Masculine & Feminine
	2	1	9-14	Writing the	Two kinds of plural

				meaning of Quranic words 9-14	Concept of (و) "And" Common Noun
2	1	1	15-17	Writing the meaning of Quranic words, phrases & translation of Sentences 15-17	Demonstrative Noun (This & That for Masculine هذا مناء Demonstrative Noun (This & That for Feminine) ذلك تلك)
	2	1	18-19 & Revision (Unit 1)	Writing the meaning of Quranic words, phrases & translation of Sentences 17-19 **Quiz**	Laam for emphasis لام التأكيد(Superlative Degree like أكبر Revision of all Quranic Sentences
3	1	2	1-3	Writing the meaning of Quranic words, phrases & translation of Sentences 1-3	Emphatic Particle ان Preposition For" اللام(Preposition)في(
	2	2	4-6	Writing the meaning of Quranic words, phrases & translation of Sentences 4-6	Preposition (على من إلى)
4	1	2	7-9	Writing the meaning of Quranic words & translation of Sentences 7-9	Preposition (الياء Absolute Negation Particle Exceptive Particle) (ما) (إلا) اعية الثانية) (للجنس
	2	2	10-13 & Revision (Unit 2)	Writing the meaning of Quranic words, phrases & translation of Sentences 10-13 **Quiz**	Subordinating Conjunction(as) Vocative Particle حرف النداء(
5	1	3	1-2	Writing the meaning of Quranic phrases 1-2	Quranic Adjective Compounds (صفة وموصوف)
	2	3	3-5	Writing the meaning of Quranic phrases & translation of sentences 3-5	Quranic Possessive Construction مضاف ومضاف إليه)
6	1	3	6-7	Writing the meaning of Quranic phrase translation of sentences 6-7	Quranic Possessive Construction (مضاف ومضاف إليه)

	2	3	8-10 & Revision (Unit 3)	Writing the meaning of Quranic phrase & translation of sentences 8-10 **Quiz**	Active Participle اسم الفاعل Passive Participle)اسم المفعول Dual)مثنى(
7	1	4	1-2	Writing the meaning of Quranic phrase & translation of sentences 1-2	Personal Pronoun He المنفصل Possessive Pronoun His المتصل
	2	4	3-4	Writing the meaning of Quranic phrase & translation of sentences 3-4	Possessive Pronoun with prepositions like في بيته Pronoun "His" with prepositions like له، منه، فيه
8	1	4	5-8	Writing the meaning of Quranic sentences 5-8	Personal Pronoun You انت المنفصل Possessive Pronoun Your المتصل Possessive Pronoun with prepositions like في بيتك Pronoun "your" with prepositions like لك، منك، فيك
	2	**Mid Term**			
9	1	4	9-12	Writing the meaning of Quranic phrases & sentences 9-12	Personal Pronoun She) هي المنفصل Possessive Pronoun Her ها المتصل Possessive Pronoun with prepositions like في بيتها Pronoun "Her" with prepositions like لهاء
	2	4	13-16	Writing the meaning of Quranic phrases & sentences 13-16	Personal Pronoun 1) أنا المنفصل (Possessive Pronoun Her المتصل Possessive Pronoun with prepositions like في بيتي Pronoun "My" with prepositions like لي
10	1	4	17 & Revision Unit 4	Revision of all Quranic sentences of Unit 4 **Quiz**	Adverb)ح(
	2	5	1-2	Writing the	Masculine Plural

				meaning of Quranic phrases & sentences 1-2	جمع المذكر السالم و جمع المذكر السالم المسبوق بحرف الجر
11	1	5	3-4	Writing the meaning of Quranic phrases & sentences 3-4	Possessive Construction with Plurals جمع المذكر السالم المسبوق بالإضافة
	2	5	5-6	Writing the meaning of Quranic phrases, sentences & verses. 5-6	Personal Pronoun They المنفصل Possessive Pronoun Their هم المتصل
12	1	5	7-8	Writing the meaning of Quranic phrases, sentences & verses 7-8	Possessive Pronoun with prepositions like في بيتهم Pronoun "Their" with prepositions likeلهم
	2	5	9-11	Writing the meaning of Quranic phrases, sentences & verses. 9-11	Personal Pronoun You) أنتم المنفصل Possessive Pronoun Your كم المتصل Possessive Pronoun with prepositions like في بيتكم
13	1	5	12-14	Writing the meaning of Quranic phrases & sentences & verses 12-14	Pronoun "Your" with prepositions like لكم Personal Pronoun We) نحن المنفصل Possessive Pronoun Our نا المتصل
	2	5	15-16	Writing the meaning of Quranic sentences & verses 15-16	Possessive Pronoun with prepositions like في بيتنا Pronoun "Our" with prepositions likeلنا
14	1	5	17-18	Writing the meaning of Quranic sentences & Verses 17-18	Demonstrative Pronoun These, Those) هؤلاء أولئك
	2	5	19-23	Writing the meaning of Quranic sentences & Verses 19-23	ما / إلا إن / إلا إنما، ليس ما ، (أم أن يل، كان( ) ألا، أليس، اليوم، يومئذ، سبحان ما بينهما، قل، إذن، بنس، نعم، كلا ما أدراك، حسب أعلم ب، (مصير مرجع دينا (تمييز
15	1	5	Revision Unit 5	**Quiz**	
	2	5	1-3 (till Page 16)	Writing the meaning of Quranic	Introduction of Present فعل مضارع)

				Verbs &Translation of Quranic Sentences & Verses (1-3)	Tense Verbal Sentence (جملة فعلية Present Tense الفعل المضارع صيغة المفرد يعلم
16	1	6	3 (From Page 17) & 4-5	Translation of Quranic Sentences & Verses 3-5	Present Tense الفعل المضارع صيغة المفرد يعلم
	2	6	6	Translation of Quranic Sentences & Verses	Present Tense الفعل المضارع صيغة الجمع يعلمون
Final Term					

SEMESTER-3

IS-202 Ideology and Constitution of Pakistan

Course Outline:

Ideology of Pakistan:

- Definition and explanation of Ideology, Historical Background with reference to Shah Wali Ullah, Sir Syed Ahmad Khan, Ali Gargh and other movements
- References from the Speeches and Statements of Allama Dr. Muhammad Iqbal and the Quaid I Azam Muhammad Ali Jinnah.
- The Role of Women and Students in Freedom Movement.
- Aims and Objectives of the creation of Pakistan: Sovereignty of Allah, Islamic Democracy, Balanced Economic System, Protection of Muslim Civilization and Culture, Protection of Minority Rights, Unity of Muslim World, Self Sufficiency and Rule of Law.

Ideological Awakening during 20th Century Colonial British India:

- Evolution of Two Nation Theory, Urdu-Hindi Controversy, Partition of Bengal, Simla Deputation.
- Establishment of All India Muslim League (AIML): Objectives, Organization and Achievements.
- Khilafat Movement and Non-Cooperation movement.
- 14 Points of Jinnah, Iqbal's Allahabad Address 1930 and Pakistan Resolution 1940.
- Emergence of the First Ideological Muslim State: Pakistan, Initial Problems and efforts to cope with, under the leadership of Quaid I Azam: The Governor General and Liaqat Ali Khan: The Prime Minister.

The Constitutions of Islamic Republic of Pakistan:

- Basic Concept of State and Constitution, Nationalism, Polity and Types of Governments (Parliamentary and Presidential), Organs of the State: The Legislature, The Executive and The Judiciary.
- Distribution of Powers in the Constitution: The Federal List, The Provincial List and The Concurrent List.
- Major Causes of Delay in the Process of Constitution Making in Pakistan: Geographical Position of East Pakistan and West Pakistan, Nature of the State (Islamic vs Secular), and Federalism.

- The First Constituent Assembly 1947-1954: Historical Address of the Quaid I Azam in the Inaugural Session on 11th August 1947. The Objectives Resolution 1949 and Basic Principles Committee's Reports.
- The Second Constituent Assembly and Parliamentary Constitution of 1956.
- The Presidential Constitution of 1962.
- The Constitution of 1973: Salient Features, Fundamental Rights (Articles 8-28), Principles of the State Policy (Articles 29-40), Responsibilities of the Pakistani Citizens (Article 5) and Islamic Provisions.
- Procedures of Amending the Constitution, Major Amendments in the Constitution of 1973 and their Impact on Pakistan's Polity.

PHY-211 ENVIRONMENTAL PHYSICS

Course Outline:

Introduction to the Essentials of Environmental Physics:

Transport of matter, Energy and momentum, Structure of the atmosphere, vertical profiles in the lower layers of the atmosphere, Lateral movement in the atmosphere, Atmospheric Circulation, cloud and Precipitation, The atmospheric greenhouse effect.

Basic Environmental Spectroscopy:

The emission spectrum of sun, The transition electric dipole moment, The Einstein Coefficients, Lambert – Beer's law, The spectroscopy of bi-molecules, Solar UV and life, The ozone filter.

Transport of Pollutants:

Diffusion, flow in reverse, ground water. Flow equations of fluid Dynamics, Turbulence, Turbulence Diffusion, Gaussian plumes in air, Turbulent jets and planes.

Noise:

Basic Acoustics, Human Perceptions and noise criteria, reducing the transmission of sound, active control of sound.

Radiation:

General laws of Radiation, Natural radiation, interaction of electromagnetic radiation and plants, utilization of photo synthetically active radiation.

Climatology and Measurements of Climate Factor:

climatic indices, General characteristics of measuring equipment. Measurement of temperature, air humidity, surface wind velocity, Radiation balance, precipitation, Atmospheric Pressure,

ES-202 ECONOMIC ASPECTS OF ENVIRONMENTAL PROTECTION

Course Outline:

Introduction to economics; scope and fundamental concepts of Economics: Consumer behavior, Producer behavior, and Resource allocation. Optimum utilization of resources from consumer, producer and community point of view. Economic development, economic progress, economic growth, economic welfare and difference among all. Man environmental relationship, Impact of economic activity on environment, Sustainable development, Measures for sustainable development. Sustainable development in developed and developing countries. Pakistan economic context: Environmental economics, Economic management and environmental quality, economic growth and its measurement, population and environmental quality, Natural resources and the economy, interaction between ecology and economic management. Economic functions of environment.

CY – 221 INORGANIC AND ORGANIC CHEMISTRY

Course outline:
Overview of periodic table, Molecular orbital theory, Chemistry of solutions, Chemistry of transition metals, coordination compounds, and radioactive elements, Crystalline state of metals and lattice structure, Industrial inorganic chemistry, Qualitative and group theory of inorganic chemistry, Functional groups, Interconversion of functional groups, unit processes: reaction mechanism of (a) Sulfonation (b) Nitration (c) Hydrogenation (d) Amination (e) Halogenation (f) Oxidation (g) Polymerization

CY-221L INORGANIC AND ORGANIC CHEMISTRY

Identification of various functional groups and their confirmation analysis in organic compounds, Evaluation of various cations and anions in the unknown salt, complexometric titrations.

MA-154 QUANTITATIVE REASONING-I

1. Numerical Literacy:
   - Number system and basic arithmetic operations;
   - Units and their conversions, dimensions, area, perimeter and volume;
   - Rates, ratios, proportions and percentages;
   - Types and sources of data;
   - Measurement scales;
   - Tabular and graphical presentation of data;
   - Quantitative reasoning exercises using number knowledge.
2. Fundamental Mathematical Concepts:
   - Basics of geometry (lines, angles, circles, polygons etc.);
   - Sets and their operations;
   - Relations, functions, and their graphs;
   - Exponents, factoring and simplifying algebraic expressions;
   - Algebraic and graphical solutions of linear and quadratic equations and inequalities;
   - Quantitative reasoning exercises using fundamental mathematical concepts.
3. Fundamental Statistical Concepts:
   - Population and sample;
   - Measures of central tendency, dispersion and data interpretation;
   - Rules of counting (multiplicative, permutation and combination);
   - Basic probability theory;
   - Introduction to random variables and their probability distributions
   - Quantitative reasoning exercises using fundamental statistical concepts.

ES-214 PSYCHOLOGY & ETHICS

Course Outlines:

Introduction to Psychology; nature and application of Psychology with special reference to Pakistan. Historical Background and Schools of Psychology. Methods of Psychology:

observation; case history method, experimental method, survey method, interviewing techniques. Biological basis of behaviour: Neuron structure and functions; Central Nervous System and Peripheral Nervous System Endocrine Glands. Sensation, Perception and Attention. Motives, Emotions, Learning, Memory and Individual Differences.

IS-209L/IS-213L FEHM-E- QURAN/SOCIAL ETHICS-II

Course Outline:

Weeks	Lectures	Units	Lessons	Assignments/ Home Task	
1	1	6	6	Understanding & Translation of Verses	Present Tense صیغة جمع مذکر غائب مثل یعبدون
	2	6	7-8	Understanding & Translation of Verses	Present Tense صیغة جمع مذکر غائب مثل یعبدون
2	1	6	9-10	Understanding & Translation of Verses	Present Tense صیغة مفرد مذکر مخاطب (تعبد) وجمع مذکر مخاطب (تعبدون)
	2	6	11-12	Understanding & Translation of Verses	Present Tense صیغة جمع مذکر مخاطب (تعبدون) صیغة المتکلم (أعبد)
3	1	6	13	Understanding & Translation of Verses	Present Tense صیغة جمع المتکلم (نعید)
	2	6	14-15	Understanding & Translation of Verses	Negative Imperative صیغة المفرد وصیغة الجمع لا تعبد لا تعبدوا
4	1	6	16-17	Understanding & Translation of Verses	Conditional Sentences & masdar moawal ((مصدر) موول
	2	6	18-19	Understanding & Translation of Verses	Laam uttaleel (لام التعلیل)Laam ul jhood (لام الجحود
5	1	6	20-21	Understanding & Translation of Verses	Present with object pronouns &

					Passive Voice
	2	6	Revision (Unit 6)	**Quiz**	
6	1	7	1 (sec 1-3)	Understanding & Translation of Verses	Past Tense صيغة المفرد الغائب
	2	7	1 (sec 4-5)	Understanding & Translation of Verses	Past Tense صيغة المفرد الغائب
7	1	7	1 (sec 5-6)	Understanding & Translation of Verses	Past Tense صيغة المفرد الغائب
	2	7	1 (sec 7-9)	Understanding & Translation of Verses	Past Tense صيغة المفرد الغائب
8	1	7	Revision	Understanding & Translation of Verses **Quiz**	Past Tense صيغة المفرد الغائب
	2	**Mid Term**			
9	1	7	2 (sec 1-2)	Understanding & Translation of Verses	Past Tense صيغة الجمع للغائب عبدوا
	2	7	2 (sec 3)	Understanding & Translation of Verses	Past Tense صيغة الجمع للغائب عبدوا
10	1	7	2 (sec 4-5)	Understanding & Translation of Verses	Past Tense صيغة الجمع للغائب عبدوا
	2	7	2 (sec 6-7)	Understanding & Translation of Verses	Past Tense صيغة الجمع للغائب عبدوا
11	1	7	3 (sec 1-2)	Understanding & Translation of Verses	Past Tense صيغة الجمع للمتكلم عبدنا
	2	7	3 (sec 2-3)	Understanding & Translation of Verses	Past Tense صيغة الجمع للمتكلم عبدنا
12	1	7	3 (sec 3-4)	Understanding & Translation of Verses	Past Tense صيغة الجمع للمتكلم عبدنا
	2	7	3 (sec 4-5)	Understanding & Translation of Verses	Past Tense صيغة الجمع للمتكلم عبدنا
13	1	7	4 (sec 1-2-3)	Understanding & Translation of Verses	Past Tense صيغه الجمع للمخاطب عبدتم
	2	7	4	Understanding	Past Tense

			(sec 4-5)	& Translation of Verses	صيغه الجمع للمخاطب عبدتم
14	1	7	5-6	Understanding & Translation of Verses	Past Tense صيغه المتكلم والمخاطب عبدتُ عبدتَ
	2	7	7	Understanding & Translation of Verses **Quiz**	Past Tense صيغة المؤنث للغائب عبدت
15	1	7	8	Understanding & Translation of Verses	Passive Voice (Past Tense) فعل مجهول للمفرد
	2	7	9	Understanding & Translation of Verses	Passive Voice (Past Tense) فعل مجهول الجمع
16	1	8	1-4	Understanding & Translation of Verses	Imperative Verb for singular فعل الأمر للمفرد
	2	8	5-8	Understanding & Translation of Verses	Imperative Verb for plural فعل الأمر للجمع
Final Term					

SEMESTER-4

ES – 204 ECOLOGY & ENVIRONMENT

Course Outlines:

Introduction and branches of ecology. Levels of ecological organization: species, population, community and ecosystem. Abiotic and biotic factors. Concepts of limiting factors, habitat and niche. *Populations:* distribution and abundance, population dynamics and distribution limits. *Community:*organization and various concepts, community dynamics. *Ecosystem:* structure and function, energy flow and material cycling within ecosystem and carrying capacity. Biomes of the world. Ecological production: primary and secondary productivity, productivity of different ecosystems.

ES-205 MICROBIOLOGY AND ENVIRONMENT

Course Outline:

Introduction and history of environmental microbiology. Groups of microorganisms: protozoans, algae, fungi, bacteria and viruses (general characteristics). Bacterial cell structure and metabolism. Eubacteria and archea. Characterization of bacterial colonies and cells. Environmental factors affecting the microbial growth. Microbial genetics (Conjugation,

transformation and transduction). Microbial interactions. Role of microbes in environment/industry: biogeochemical cycles, biodegradation and bioremediation, food and health, biological warfare agents.

ES-205L MICROBIOLOGY AND ENVIRONMENT

Introduction to basic techniques for sterilization/disinfection, isolation, purification and characterizations, Dilution plate technique, Mean plate count, microscopy. Measurement of bacterial growth.

ES-206 ENVIRONMENTAL CHEMISTRY

Course Outline:

Basic Concept of environmental chemistry w.r.t. rural, urban and industrial activity, chemistry of atmosphere, hydrosphere and lithosphere, pollution sources and their distribution in environment, acid rain, photochemical smog, particulates, Ozone chemistry, Greenhouse effect and Global warming, Chemical toxicology and hazardous waste Organic and inorganic toxins and their analysis Treatment of aqueous effluent streams, environmental degredation and protection, Bioremediation of contaminated soils, New trends in environmental chemistry, industrial and municipal waste streams.

ES-206L ENVIRONMENTAL CHEMISTRY

Soil analysis, water analysis, Gravimetric and Volumetric methods of analysis for main groups of pollutants, Environmental significance and determination of DO, COD, BOD, Halide ions, Hardness, Alkalinity, TDS, Turbidity and anions in environmental samples using Chemical and Instrumental methods.

HU-212 CIVICS AND COMMUNITY ENGAGEMENT

Introduction to Civics and Community Engagement: a) Definitions of civics, citizenship, and civic engagement b) Historical evolution of civic participation and community development **Introduction to Citizenship:** a) Types and characteristics of effective citizenship: active, participatory, corporate, and digital, etc. b) Attributes of a responsible citizen c) Relationships between democracy and citizenship. **State, Government, and Civil Society:** a) Structure and functions of government in Pakistan b) The relationship between democracy, dictatorship, and civil society c) Right to vote and importance of political participation and representation **, Rights of Pakistani Citizens under the Constitution**: Overview of fundamental rights and liberties of citizens under the Constitution of Pakistan 1973. **Sustainable Development Goals, Social Issues and Media**: : a) Sustainable Development Goals (SDGs) b) Social issues in Pakistan c) Role of media d) Islamophobia, media, and multiculturalism. **Civic Responsibilities/Duties:** a) Civic responsibilities/duties (family and society) b) Ethical considerations in civic engagement (accountability, non-violence, peaceful dialogue, and civility, etc, **Community Engagement and Approaches to Effective Community Engagement:** a) Concept, nature, and characteristics of community b) Community development and social cohesion c) Approaches to effective community engagement. d) Case studies of successful community driven initiatives. **Advocacy and Activism:** a) Public discourse and public opinion b) Role of advocacy in addressing social

issues c) Protesting peacefully and effectively d) Social action movements Digital Citizenship and Technology: a) The use of digital platforms for civic engagement b) Cyber ethics and responsible use of social media c) Cyberbullying d) Digital divide and disparities (access, usage, socioeconomic, geographic, etc.) and their impact on citizenship, **Environment and Society**: Climate action, **Diversity Inclusion and Social Justice:** a) Understanding diversity in society (ethnic, cultural, economic, and political, etc.) b) Children's rights, safety, and literacy c) Youth, women, and minority engagement in social development d) Animal rights e) Addressing social inequalities and injustices in Pakistan f) Promoting inclusive citizenship and equal rights for societal harmony and peaceful co-existence.

HU-200 TECHNICAL REPORT WRITING

Introduction to Technical Communication, The Writing and Proofreading Process, Paragraph Writing, Business Correspondence and Employability Skills, Writing Practice, Writing Technical Reports, Introduction to Research Writing and Report Writing, Writing Reports, Publishing and Presenting Reports

MA-259 QUANTITATIVE REASONING II

1. Logic, Logical and Critical Reasoning:
   - Introduction and importance of logic;
   - Inductive, deductive and abductive approaches of reasoning;
   - Propositions, arguments (valid; invalid), logical connectives, truth tables and propositional equivalences;
   - Logical fallacies;
   - Venn Diagrams;
   - Predicates and quantifiers;
   - Quantitative reasoning exercises using logical reasoning concepts and techniques.
2. Mathematical Modeling and Analyses
   - Introduction to deterministic models;
   - Use of linear function for modeling in real-world situations;
   - Modeling with the system of linear equations and their solutions;
   - Elementary introduction to derivatives in mathematical modeling;
   - Linear and exponential growth and decay models;
   - Quantitative reasoning exercises using mathematical modeling
3. Statistical Modeling and Analyses
   - Introduction to probabilistic models;
   - Bivariate analysis, scatter plots;
   - Simple linear regression model and correlation analysis;
   - Basics of estimation and confidence interval;
   - Testing of hypothesis (z-test; t-test);
   - Statistical inference in decision making;
   - Quantitative reasoning exercises using statistical modeling.

SEMESTER-5

ES-301 ENVIRONMENTAL TOXICOLOGY

Course Outline:

Introduction to Toxicology: Classification and properties of toxic substances: anthropogenic and natural poisons, acute and chronic effects, genotoxic, mutagens, teratogens, carcinogens and sensitizers. Biological properties of organic and inorganic pollutants: essentiality and toxicity. Routes of absorption. Bioaccumulation and bio-magnification. Quantification of toxicity: dose-response relationships, synergism, antagonism, LD50 and rating systems, Threshold Limit Values. Toxic impacts of atmospheric agents. Fate of absorbed toxins and xenobiotics, including detoxification and bioactivation. Natural detoxification processes. Risk management.

ES-301 L- ENVIRONMENTAL TOXICOLOGY

Analysis of toxins, Dose-response relationship and D/R Curves. In vitro & In vivo techniques for toxicity testing. Proposed techniques (at least one of these); Ames test, Comet assay, CAM, TTC and Immuno-fluorescent assay or microscopic observation of changes in plant cell morphology after exposure to toxic substances.

ES-302 ENVIRONMENTAL PROFILE OF PAKISTAN

Course Outline:

Introduction to history of the region; Features: land, geography, people, culture, health, education; Environmental Information and Their Sources in Pakistan: Data and Information Type and Their Hierarchy: Compendium of Environmental Statistics; Ecological: ecological zones, major ecosystems, topographic zones; Economic: agriculture, industry, water resources, urbanization and pollution.

ES-304 ANALYTICAL TECHNIQUES IN ENVIRONMENTAL SCIENCE

Course Outline:

Quality assurance in an Environmental Science laboratory. Purposes and designs of environmental sampling. Sample collection and preservation methods. Standard solutions and standard curves. Analysis of water, wastewater and soil/solid waste samples. Instrumentations: principles and procedure for Electroanalytical Techniques; Potentiometery, Conductometry, pH metery, Spectroscopy (Atomic Absorption) and Chromatography (GC, HPLC). Mass Spectrometery and ICP MS etc.

ES-304 L ANALYTICAL TECHNIQUES IN ENVIRONMENTAL SCIENCE

Environmental sample analysis (with reference to soil and air analysis) will be performed using different Analytical techniques like volumetric analysis, spectroscopic techniques and instruments like spectrophotometer will be used.

ES-305 PROJECT PLANNING & MANAGEMENT

Course Outline:

Overview [of Project Management], Project Management Growth: Concepts and Definitions, Organizational Structures [used in Project Management], Organizing and Staffing the Project

Office and Team, Management Functions [in a Project Environment], Management Of Time And Stress, Conflicts, Special Topics [in Project Management], The Variables for Success, Working With Executives, Planning, Network Scheduling Techniques, Project Graphics, Pricing and Estimating, Cost Control

ES-306 HYDROLOGY & WATER POLLUTION

Course Outline:

Principles of Hydrology, Surface water origin, Occurrence, Distribution and movement. Hydrologic Cycle, Hydrographs, Precipitation, Evaporation, Infiltration, Run-off and its types, Basic equations, Stream flow measurements. Ground water Balance, Ground water exploitation and management, Surface- Groundwater interaction and Ecosystem dependence. Water Balance, Rainfall recharge. Erosion and Silting, Water logging and Salinity problems in Pakistan. Sources of water pollution. Mechanical treatment systems. Marine Pollution Details;

ES – 307 ENERGY AND ENVIRONMENT

Course Outline:

Introduction: Energy Units, forms and types of energy, energy resources, energy use and growth patterns, energy conversion, energy use in developing countries and losses; Energy Mix; Coal Characteristics; Problems associated with Mining & Transportation and use: Petroleum history and Processing; Electric Power Generation; Environmental Issues during Survey, Population Displacement and Construction; Nuclear Energy: Nuclear Fission; Electromagnetic Spectrum, Solar Spectrum, Light Intensity at Earth, Problems with use of energy resources: Wood, Coal and Fossil fuels; local and global issues; Ecological Effects of Large Dams; Spent Nuclear Fuel Disposal Issues; Nuclear Accidents: three-Mile Island, Chernobyl, Fukushima etc. Renewable Energy Sources: Micro hydel, wind, Solar thermal, Photovoltaic, Biogas etc.; Novel Energy sources: Bio-fuels, Geothermal, Wave, Tidal; Hydrogen as an Energy Carrier, Fuel Cells, Hybrid Vehicles.

ES-307L ENERGY AND ENVIRONMENT

Energy generation methods from wood, coal and fossil fuels, conversion of solar energy into electrical energy, experiments on renewable energy sources, Field visits.

SEMESTER-6

CRP-302 GIS AND REMOTE SENSING

Course Outline:

Introduction, Definition, Key components, Functional subsystem, Raster Data Model, Vector Data Model, Conversion Between Raster and Vector Data Models, ArcGIS supported data formats, File Geodatabase and tables, Data Sources , Data Capturing Techniques and Procedures, Data Transformation, Visualization of spatial volumes Graphical variables , Data Classification Graphic approach , Overlay Analysis , Introduction to Global Positioning System (GPS) , Spatial Analysis , Network and Overlay analysis, 3D Analysis, Buffering , Spatial data quality and components of data quality , Micro level components , Macro level components,

Sources of errors, Project work, Earth Model a. Representing the Earth b. Map Projections c. Geographic and projected coordinate systems

CRP-302L GIS AND REMOTE SENSING

Introduction to GIS lab , Viewing, Projecting, Digitizing (editing and creating GIS data), Spatial and non- spatial Queries , Processing tabular data, Geo-processing, Geo-referencing, Spatial Analysis, Modeling, Presenting maps (labeling, layouts), ESRI online courses, Raster/Vector data display , Scanning , Digitization , Coordinated based point mapping map layout , Data classification , Handling topological errors , Overlays and

Network analysis, Satellite image , Future population planning , Preparation of land use map

ES-309 ENVIRONMENTAL MANAGEMENT SYSTEMS

Course Outline:

Introduction to the concept of Corporate Social Responsibility (CSR) and environmentally responsible business initiative. Introduction to principles of green economic growth. Managing the environment; Development and Implementing an Environmental Management System in organisation and society; Models for Environmental Management System; Linking Environmental Management Systems with Business strategy:

ES-309 L ENVIRONMENTAL MANAGEMENT SYSTEMS

Class room exercises on identification of environmental aspects; assessment of environmental impacts and suggestion of mitigation measures of activities of some hypothetical organization. Development of Environmental Management Plan by a group of students for a hypothetical or real organization. Industrial visits to identify environmental issues of management.

ES-310 BIODIVERSITY AND CONSERVATION

Course Outline:

Biodiversity: Introduction and levels of biodiversity (Alpha, Beta and Gamma). Biodiversity hotspots (tropical and coral reef ecosystems).Philosophical, ecological, economic, social and ethical values of biodiversity. Plants and animal resources of world and Pakistan. Conservation of biodiversity: Introduction to biological conservation, Need and approach of biodiversity conservation and prevailing threats. IUCN threatened species categories. Conservation at species and population level: applied population biology, establishing new populations, *ex-situ* conservation strategies (botanical gardens and arboreta, zoos, seed banks and aquaria).Conservation at community and ecosystem level: protected areas, their categories and objectives, considerations for reserve design, ecotourism. Conservation outside protected areas: Legal protection of species and habitats: national and international laws and agreements for species and habitat protection, National Conservation Strategy of Pakistan.

ES-310 L BIODIVERSITY AND CONSERVATION

Reconnaissance survey of different local communities. Study of analytical characteristics of local vegetation types: Population density (D), Relative density (RD), Frequency (F), Relative frequency (RF), estimating biodiversity, Habitat and ecosystem diversity: Species diversity and Genetic diversity. Indices of biodiversity: Species Richness (Richness Index), Species Diversity (Biodiversity Index), Similarity Index (Simpson's Similarity Index). Visit to National Park/Sanctuary, Zoo and Botanical Garden.

ES-311 SOLID WASTE MANAGEMENT

Course Outline:

Introduction to solid waste management; Solid waste characterization: Sources, quantities, quality; Waste collection and transport; Treatment technologies: Bioremediation strategies; Composting: Types and methods, environmental requirements, incineration, reuse and recycling; Landfills: Site design and management; Pollution and risk assessment of landfills; Biogas generation: Use of biogas digest; Recent technologies used for solid waste management.

ES – 312 OCCUPATIONAL SAFETY, HEALTH & ENVIRONMENT

Course Outline:

Introduction to occupational health and safety: Accidents, Disease, Health and safety problems worldwide, Common work place associated hazards; Chemicals in the work place, Noise at work, Manual handling, Controlling hazards: Methods of control, Elimination, Substitution, Engineering controls, Administrative controls, Personal protective equipment (PPE),Cumulative trauma disorder (CTD), Evaluation of job risk factors, Controlling vibration hazards. Male and female reproductive health hazards in the workplace, Health and safety for women and children, Labour code of Pakistan. Legislation related to health and safety at work, Check list, Role of health and safety representatives and labour union at work; meetings, reports, training education, negotiation, Role of government, Health and safety committee.

ES-312L OCCUPATIONAL SAFETY, HEALTH & ENVIRONMENT

Fire emergency procedures, essential to know about chemical hazardous, health and safety rules for human beings on work place, response to chemical spills, reports and trainings on personal protective equipment and risk factors.

MGT-349 ENTREPRENEURSHIP

Introduction to management and entrepreneurship; functions of management; developing successful business ideas; recognizing opportunities and generating ideas; feasibility analysis; developing an effective business model; industry and competitor analysis; writing a business plan; moving from an idea to an entrepreneurial firm; preparing the proper ethical and legal foundation; assessing a new venture’s financial strength and viability.

SEMESTER-7

ES-401 AIR POLLUTION

Course Outline:

Air Pollution Essentials; The Risks of Air Pollution; Measurement and Monitoring of Air Pollution; The methodology of Air Pollution; The Regulatory Control of Air Pollution; The Engineering Control of Air Pollution; Introduction to Noise Pollution; Basic concepts of sound and noise; Noise and its effects; approaches to noise problems; Planning to control noise pollution; Noise reduction; Characteristics and impact of surface transportation noise; Traffic noise reduction; Aircraft noise reduction; Preventing airport noise; Control of noise pollution from diesel generator sets; Noise pollution in oil exploring and its control; noise pollution and its control in mining and product industries; Sound control technologies and instrumentation. Electromagnetic waves generated by cellular tower and its potential impact on humans and the environment. Smog, Air Born biological pollutants;

ES-402 ENVIRONMENTAL IMPACT ASSESSMENT

Course Outline:

Introduction: principles, concepts and purposes of IEE and EIA and its significance for the society. Cost and benefits of EIA. Main stages in EIA process. Public consultation and participation in EIA process. Methods and techniques for impact prediction and evaluation. Integration during project life cycle. EIA review and post project analysis. EIA process management. Role of quality assurance and quality control in environmental analysis. EIA Regulations and guidelines in Pakistan.

ES-402 L ENVIRONMENTAL IMPACT ASSESSMENT

Screening & Scoping exercises, Using impact prediction and analysis tools; i) Checklist, Matrices, Networks, Overlays. Organizing public Participation; identifying stakeholders, role plays exercises, Field Visit, One case study to be completed by the end of the semester.

ES-403 RESEARCH METHODS IN ENVIRONMENTAL SCIENCES

Course Outline:

Purpose of Research; Research Project Conceptualization, Choice of Methods; Elements of a Research Proposal, Operationalization choices and illustrations. Research Design: formulation of research design, pretesting of research instruments and procedures, units of Analysis, time dimension; Experimental design and use of indicators in research, Survey Research: Guidelines for asking question and questionnaires construction, Selfadministered questionnaires, Interview and other survey methods; their strength and weaknesses. Sampling: the logic of sampling, concepts and terminologies, population and sampling frames, types of sampling design. Field Studies: Steps in the conducting field study; Evaluation Research: How to carry out evaluation research; Analytical tools in research: qualitative and quantitative methods; Statistical Analyses: Univariate, Bivariate and Multivariate analyses.

ES-404 ENVIRONMENTAL SAMPLING & MONITORING

Course Outline:

Introduction, objectives of sampling and monitoring programme, design and types of samples, pre-sampling requirements/information, sampling and design purposes, application of national and international methods of sampling, regulatory purposes for NEQS compliance, EIA requirement, NOC for plant operation, Determination of concentration and distribution of a specific pollutant environment sampling techniques. Quality assurance and

quality control, Planning analytic protocols, quality assurance programmes, quality control sampling. Considerations, quality assessment, field custody, laboratory custody. Preservation methods including pH control, chemical addition, refrigeration and freezing methods.

Biological indicators for environmental monitoring, role of biomarkers in environmental assessment.

ES-404 L ENVIRONMENTAL SAMPLING & MONITORING:

Sampling techniques (air, water and soil) for physical and chemical monitoring, Wet digestions and extractions for separations; Study the indicators for biological monitoring of the river and canal water, the indicators for ecological monitoring in the field for fauna and flora, Use of various instrumental techniques for analysis of samples, Field visit/ study tour to water testing laboratory/local water authority and report writing, Visit to EPAs for the study of air and water monitoring procedures, Report on monitoring of municipal waste

ES -414 ENVIRONMENTAL NANOTECHNOLOGY

Course Outline:

Introduction to nanotechnology, basic nanomaterials and their classification, Synthesis of nanomaterials, Nucleation and growth, Ostwald ripening, Nanobiomaterials Application of nanomaterials in: remediation of polluted soil and water, pollutant sensing and detection, filtration membranes, green chemistry; Nanomaterials as adsorbents; Nanomaterials for groundwater remediation; Use of nanomaterials as antimicrobial agents; Renewable energy and nanotechnology; Eco-toxicological risks associated with nano-materials; Future challenges in nanotechnology.

SEMESTER-8

ES 405 ENVIRONMENTAL GOVERNANCE

Course Outline:

The concept of governance and its relevance to environment; the role of government in a state; derivation of environmental legislation from constitution of Pakistan; Environmental Policies in Pakistan, federal, provincial and local legislation in Pakistan; rules and regulations made there under. Environmental institutions established for enforcement of environmental laws in Pakistan and their functions in federal and provincial level.

ES-406 CLIMATE CHANGE

Course Outline:

Defining Climate, Climate system: Components; controls on climate; Latitude, Earth-sun relationships, Revolution, Rotation, Axial tilt and their combined effect, Distance to large bodies of water, Defining Climate Change, Climate change processes, Green House Gases' emission, Drivers and Indicators of Climate Change, Cause & Effect of Climate Change,

Climate Change Policy, Impacts of Climate Change in Pakistan, Green Economy, Carbon Footprint, Technological Development and Changing climate, Climate Change matters, Present rapid warming, Projection of future climate change, Uncertainty in climate change projections, Climate change impacts-reasons for concern, Impacts on natural systems, societal systems, human health and comforts, Reactions and attitudes to climate change: Adaptation, Mitigation options: increased energy efficiency, fuel substitution, nuclear power, solar energy, wind power, biomass energy, tidal, wave and geothermal energy, hydrogen economy, changes in infrastructure and behavior.

ES 408 POLLUTION CONTROL TECHNOLOGIES

Course Outline:

Collection, treatment and distribution of drinking water supply; Collection, treatment and disposal of municipal and industrial wastewater; Low cost water treatment and sanitation techniques; Solid and hazardous waste management; Cleaner techniques; Waste hierarchy (Reduce, re-use and recycling); Waste site investigation and remediation; Air pollution control; Noise pollution control.

ES 409 NATURAL RESOURCE MANAGEMENT

Course Outline:

Natural resources, concepts (tragedy of the commons, resource degradation, carrying capacity, ecological footprints), Human demands on natural resources, existing situation in world and in Pakistan, History of natural resource management, sustainable management of natural resources, conservation, preservation, Community based natural resource management, plan: needs, and contents of the management plan. Forest management: forest types and its existing management, watershed management: methodologies, national example, wetland management: key threats, National wetland policy and brief introduction to Ramsar convention, rangeland management: existing status, importance, threats, causes and methods for its improvement. Rotational grazing, seasonal grazing, National Rangeland policy of Pakistan, livestock management, wildlife management: Management existing situation at national level, wildlife census, reasons for its decline and its possible remedies, sustainable/trophy hunting projects and its role in local and national development, national and provincial legislation. Agriculture and Minerals resource management; Water Resource Management: Fisheries Management:

ES -413 URBAN ENVIRONMENTAL MANAGEMENT

Course Outline:

Introduction to the concept of Corporate Social Responsibility (CSR) and environmentally responsible business initiative. Introduction to principles of green economic growth. Management of urban infrastructure and services, Adaptation approaches to disaster risks and climate change, Provision of urban solidwaste services, and its impact on climate change, Environmental systems analysis and sustainability assessment, Water supply and sanitation management, Adaptation approaches to disaster risks and climate change.

HU-003 INTERNATIONAL LANGUAGE

To be opted as per humanities department