SARDAR PATEL UNIVERSITY
B.Sc. Semester V Environmental Science
Under Choice Based Credit System
Syllabus with effect from June 2020

Course type	Course code	Name of the course	T/P	Credit	Contact hrs per week	Exam duration in hrs	Component of Marks		
							Internal	External	Total
Env Science Core Course	US05CENV21	Enviromental Biotechnology	T	4	4	3	30	70	100
	US05CENV22	Geological Science & Oceanography	T	4	4	3	30	70	100
	US05CENV23	Environmental Pollution	T	4	4	3	30	70	100
	US05CENV24	Forensic science & Remote Sensing	T	4	4	3	30	70	100
	US05CENV25	Practical	P	6	12	6	45	105	150
Discipline specific elective (Any One)	US05DENV26	Env Health & Stress Physiology	T	2	2	2	-	50	50
	US05DENV27	Disaster Management	T	2	2	2	-	50	50

SARDAR PATEL UNIVERSITY
THIRD YEAR B.Sc. (FIFTH SEMESTER)
ENVIRONMENTAL SCIENCE
USO5CENV21(T) (Environnemental Biotechnology)
(Four credit course, Four hours per week)
(Effective from June 2020)
(Total marks- 100, internal marks-30, external marks -70)

Unit	Topics	Weightage
1	**UNIT: 1** **Fundamentals of Environmental Biotechnology:** Introduction, Recombinant DNA technology and various steps involved, Enzymes Restriction Endonucleases, Vectors and their types, Applications of R DNA tech, Gene transfer in plants and animals with suitable examples, GMO and their risk assessment	25%
2	**UNIT:2** **Tissue Culture** Plant tissue Culture- Introduction, Totipotency of cell, General process, Tissue culture laboratory and Instruments, Nutrient media composition, Callus culture, Anther culture, Protoplast culture, Advantages and Limitations of plant Tissue culture Animal tissue Culture- Introduction, Types of Cuture- batch and continuous,Cell culture, Organ culture, Protoplast culture, Adherent vs Suspension culture, Primary culture, Techniques, Types of culture media, , Applications, Cryopreservation	25 %
3	**UNIT: 3** **Bioremediation** Introduction, Mechanism, Essential factors, Advantages/Disadvantages. Types of Bioremediation : In Situ- Intrinsic and accelarated, methods- Biostimulation, Bioaugmentation, Biosparging, Bioventing. Ex Situ- Composting, Landfarming, Biopiling,Bioreactor. Scope, Application, Bioremediation of - Contaminated soils, Aquifers, Marine Oil spill, Air pollutants,Xenobiotics	25%
4	**UNIT: 4** **Phytoremediation** Introduction, Mechanism, Types of Phytoremediation: - Phytoextraction,Phytostimulation, Phytostabilization,Phytovolatilization,Phytotransformation, Rhizofiltration, Hyper accuulaters species, Types of Plants used for phytoremediation, Applications of Phytoremediation.	25%

Suggested Books for reference :

1) A textbook of Biotechnology – R.C. Dubey
2) Biotechnology- A textbook of Industrial Microbiology – Wulf Gueger and Anneliese Crueger
3) Biotechnology and Genomics – P.K. Gupta
4) Biotechnology- Expanding Horizons – B.D.Singh
5) A textbook of Biotechnology – H.K.Das
6) Textbook of Agriculture Biotechnology by Ahindra Nag
7) A Book of Tissue culture by Kalyan Kumar Dey

SARDAR PATEL UNIVERSITY
THIRD YEAR B.Sc. (FIFTH SEMESTER)
ENVIRONMENTAL SCIENCE
USO5CENV 22(T) (Geological Science & Oceanography)
(Four credit course, Four hours per week)
(Effective from June 2020)
(Total marks- 100, internal marks-30, external marks -70)

UNIT	DESCRIPTION IN DETAIL	WEIGHTAGE (%)
1	**Geomorphology:** Definition, Geomorphic processes: Gradation, degradation, weathering, erosion and aggradations, Diastrophism. River-its pattern; drainage system. Land form-characteristics. Mineral structure-introduction; composition; major and trace elements; mineral stability diagrams and control on the chemistry of natural waters; geochemical cycles.	**25**
2	**Geological Hazards:** Volcanism-Definition, Classification, characteristics and impacts. Earthquake-Definition, physical properties, earthquake severity, causes, prediction mitigation strategies. Definition, Physical characteristics, causes, prevention and controlofLandslide, Flood, Tsunami, Drought, Cyclone.	**25**
3	**Oceanography-1:** Introduction, Distribution of world ocean water bodies, Oceans nomenclature; shape, size and volume. Relief of the ocean floor-continental shelf, continental slope, mid ocean ridge, gyot, sea mount, Deep sea plain & Trenches. Physical properties of seawater – temperature, dissolve oxygen, density, viscosity, surface tension and conductivity.	**25**
4	**Oceanography -2 :**Ocean Tides, Tidal waves, Estuarine environment; definition; types of estuaries; estuarine organisms; estuarine productivity; estuarine food webs. Coral Reefs, Marine Deposits and Ocean Resources. TS diagram -acoustical and optical characteristics of seawater. SOFAR channel. Insolation – long wave radiation. Effect of clouds. Sensible and latent heat transfer Bowen's ratio. Ocean heat transport – spatio temporal variability of heat budget terms and net heat balance.	**25**

Suggested Books for Reference :

1) Principle of Geomorphology – William D. Thornbury, New Age International Pub.
2) The Earth – Frank press and Raymond Siever- 3rd edition- W.H. Freeman and Company
3) Physical geography – Savindra Singh – Prayag pustak bhavan Pub.
4) Textbook of Geology : P.K.Mukherjee (2000) The world press Pvt.Ltd.
5) Environmental Geology : Donald R. Coates
6) Oceanography – TOM Garrison
7) Oceanography - Savindra Singh – Prayag pustak bhavan Pub.

SARDAR PATEL UNIVERSITY
THIRD YEAR B.Sc. (FIFTH SEMESTER)
USO5CENV23 (Environnement Pollution)

(Four credit course, Four hours per week) (Effective from June 2020)

(Total marks- 100, internal marks-30, external marks -70)

UNIT	DESCRIPTION IN DETAIL	WEIGHTAGE (%)
1	**Air pollution:** Definition, Sources, Effects of air pollution on human health and materials, Effects of Indoor air pollutants, Air quality standards, Sampling of pollutant-particulate matter, gases, vapour. Measurement of pollutants-Dust particles, measurement of smoke density, Stack monitoring, bio monitoring, Prevention and Control of air pollution (Venturi scrubber, Wet scrubber, Electrostatic precipitator and Cyclone precipitator).	**25**
2	**Soil Pollution:** Sources of pollutant (pesticides, sewage, organic and inorganic contamination), Effects and control measures. **Radiation Pollution:** Basic Types of radiation, sources, effects of ionizing radiation, Control of Radioactive pollution, radiation protection, radioactive waste disposal methods.	**25**
3	**Noise Pollution:** Definition, Sources, measurement of sound, effect of noise on human health, noise pollution abatement and control. **Thermal Pollution:** Definition, Sources, effect on man and aquatic ecosystem and control methods.	**25**
4	**Nuclear Pollution:** Definition, Sources, effect on man and aquatic ecosystem and control methods. **Vehicular Pollution:** Introduction, Major pollutants of Automobile Emission, Impact of Automobile Pollutants. Indian scenario, Air quality with respect to SO2, SPM, NOX, Types of fuels used for vehicles, Automobile pollution abatement.	**25**

Suggested Books for reference :

1) Environmental Engineering – Devis Cornwell 3rd edition (1998). Mc Graw Hill.
2) Environmental Engineering – Gerald Kiely (1998) Mc graw Hill
3) Environmental Engineering – A global Prospective (2000) edt by Gary Vanloon & Duffy. Oxford Pub.
4) Encyclopedia of Environmental pollution and Control – R.K.Trivedi
5) An Introduction to air Pollution – R.K.Trivedi and P.K.God (1998) Technology Pub.
6) Environmental Pollution control Engineering – C.S.Rao (1995) – Wiley Eastern ltd.
7) Nature and properties of Soil- N.C.Brady (1997) Mc. Millan pub.
8) Environmental Chemistry – A.K.De(1995), Widy Eastern.
9) Chemistry for Environmental Engineering- Sawyer, Mac Carty, Partein (1994) Mc. Graw Hill
10) Introduction to Environmental engineering and Sciences – Gilbert N. Masters (1998) Printice hall of India Pvt. Ltd New Delhi
11) Air pollution (7 volume) A.C.Stern
12) Air pollution Control Engineering – Noel De nevers – Second edition – Mc.Graw Hill international edition.
13) Environmental Pollution - Management and Control for sustainable Development – R.K.Khitoliya, S.Chand and company, New Delhi

SARDAR PATEL UNIVERSITY
THIRD YEAR B.Sc. (FIFTH SEMESTER)
ENVIRONMENTAL SCIENCE
USO5CENV24 (Forensic Science and Remote Sensing)
(Four credit course, Four hours per week)
(Effective from June 2020)
(Total marks- 100, internal marks-30, external marks -70)

UNIT	DESCRIPTION IN DETAIL	WEIGHTAGE (%)
1	**Forensic Science:** Introduction, Scope and branches of forensic science. Basic principles of forensic science. Organizational set up of Forensic Science Laboratories – Central F.S.L. and State F.S.L. Crime scene characteristics, sketching, photography, location, collection and preservation of exhibits/evidences. Physical evidence; types, significance and analysis.	**25**
2	**Applications of Forensics:** Cases of doubtful paternity – General principles, blood group systems used in problems of parentage; detectable blood group markers in blood stains, deterioration of blood stains. History and Development of Fingerprints, classification of fingerprints, Henry system and single digit classification. Applications of Forensics.	**25**
3	**Remote Sensing and GIS:** Definition and Components, Development, Principles, Platforms and Types. Characteristics of sensors. High resolution sensors – IKONOS, Quickbird, CASI.Aerial Photography and Satellite Remote Sensing: Principles, Types. EMR Interaction with Atmosphere and Earth Surface; Satellites (Landsat and IRS) and Sensors. **GIS Data Structures**: Types (spatial and Non-spatial), Raster and Vector Data Structure. Image Processing (Digital and Manual) and Data Analysis: Pre-processing (Radiometric and Geometric Correction), Enhancement (Filtering); Geo-Referencing; Editing and Output; Overlays, Interpretation.	**25**
4	**Application of Remote Sensing and GIS:** Land use/ Land Cover, Urban Sprawl Analysis; Forests Monitoring. Biodiversity management, weather monitoring, Atmospheric studies, Geospheric survey, Hydrospheric studies, wasteland management, natural disaster.	**25**

Reference Books :

1) Forensic science in criminal investigation and trial – 5th Edition by B R Sharma
2) Forensic science in India by B B Nanda
3) Forensic science- the basics 2nd Edition by Jay A Siegel & Kathy Mirakovits
4) Remote sensing and GIS by B Bhatta
5) Basics of Remote sensing and GIS by S Kumar
6) Remote Sensing Principles and applications by Dr B C Panda

SARDAR PATEL UNIVERSITY
THIRD YEAR B.Sc. (FIFTH SEMESTER)
ENVIRONMENTAL SCIENCE
USO5CENV25(P) (Practicals based on theory)
(Six credit course, Twelve hours per week)
(Effective from June 2020)
(Total marks- 150, internal marks-45, external marks -105)
(Exam duration Six horus)

PRACTICAL BASED ON ENVIRONMENTAL BIOTECHNOLOGY

1. To study aseptic techniques of Tissue culture Laboratory
2. Introduction to Lab instruments
3. Coposting of solid waste-bioremdiation
4. Anther culture
5. Callus culture
6. Heavy metal removal using Eichhornea
7. Study of Plants used for phytoremediation

PRACTICAL BASED ON GEOLOGICAL SCIENCE & OCEANOGRAPHY

1. Study of rocks (Igneous, Sedimentary and Metamorphic)
2. Determination of Iron from given geographical area
3. Analysis of soil profile of any specific area
4. Determination of Aluminum from given geographical area
5. Study of physical properties of minerals
6. Estimation of Residual Chlorine and chlorine demand
7. Determination of density and salinity of seawater and its interrelationship
8. Study of seismic profile of a specific area and its interpretation
9. Estimation of River pattern and drainage system
10. Study of major geomorphic features and their relationships with outcrops through physiographic models.

PRACTICAL BASED ON ENVIRONMENTAL POLLUTION

1. Determination of SO x From Ambient air
2. Estimation of NO x From Ambient air
3. Determination of Particulate Matter from Ambient air
4. Estimation of Moisture content and pore space in the soil
5. Assessment of Phosphorus from soil
6. Determination of Sulfur from soil
7. Determination of Copper from soil
8. Noise pollution measurement using Sound Level Meter
9. Introduction to Stack Monitoring Kit for Air Monitoring

PRACTICAL BASED ON FORENSIC SCIENCE & REMOTE SENSING

1. Remote sensing – map reading
2. Preparation of wind rose from given data
3. Cartography
4. Topographic contours, topographic sheets of various scales on maps
5. Introduction to crime detection devices
6. Demonstration of crime scene and laboratory photography
7. Fingerprint matching
8. Hair and fibre analysis
9. ABO and RH blood groups from whole blood

N.B. : Submission of Academic visit/ Study tours Reports to be given due weightage in Practical examination.

SARDAR PATEL UNIVERSITY
THIRD YEAR B.Sc. (FIFTH SEMESTER)
ENVIRONMENTAL SCIENCE
USO5DENV26 (T)
ENVIRONMENTAL HEALTH AND STRESS PHYSIOLOGY
(Two credit course, Two hours per week)
(Effective from June 2020)
(Total marks- 50, External marks -50, Exam duration Two horus)

Unit I Environmental Health

Concept of health and disease; Principles of epidemiology and epidemiologicalmethods, aims of epidemiology

Unit II Diseases

Concept on air, water, vector borne diseases; Some communicable diseases-- Viral hepatitis, dengue, Leishmaniasis; Non-communicable diseases - cardiovascular, diabetes; Immunologyelementary ideas about antigens and antibody, autoimmunity; Immunodeficiency diseases; Allergy –Antibody-mediated hypersensitivity, hypersensitivity pneumonitis, allergic rhinitis, ingestant allergy,dermatitis, drug sensitivity

Unit III Health Programs

Health Programs in India; Demography and family planning; Nutrition and health; Health education; World health report; Health impact assessment

Unit IV Environmental Stress Physiology: Concept and fundamentals; Photoinhibition and photoacclimation;Stress-agents like temperature, oxygen, salinity on plant

Reference books :

1. Stress Physiology by D P Singh. New Age International Publisher

2. Handbook of Environmental Health & Safety, Principles & Practices, Vol.1 (3rd Edition) by Raquel Duarte- Davidson

3. Environmental Health : From Global to local by Howard Frukin

4. A textbook of Env. Studies by Dr D K Asthana & Dr Meera Asthana

SARDAR PATEL UNIVERSITY
THIRD YEAR B.Sc. (FIFTH SEMESTER)
ENVIRONMENTAL SCIENCE
USO5DENV27(T)
DISASTER MANAGEMENT
(Two credit course, Two hours per week)
(Effective from June 2020)
(Total marks- 50, External marks -50, Exam duration Two horus)

Unit I Understanding Disaster

Concept and definitions of disaster; Hazard, vulnerability, risk, capacity: Types, trends, causes and consequences and control of various disasters, viz., Geological, Hydrometeorological, Biological and Technological disasters

Unit II Disaster Management

Vulnerability of natural hazards in India; Disaster management cycle; Activities associated with various stages of cycles

Unit III Institutional Framework

Constitutional frameworks in India – Role of Governments, Non Governments and State Government agencies

Unit IV Risk Assessment

Concept and evaluation of risk; Hazard identification; Exposure assessment; Hazard assessment; Risk characterization; Man-made Environmental degradation; Problems related to toxic wastes and chemicals and radioactive substance disposal

Reference Books :

1. Disaster Management by Savindra Singh, Jeetendra Singh

2. Disaster Management and Preparedness by Nidhi Gupta, Dhawan and Ambrina Sardar Khan

3. Safety and Disaster Management by Dr S Arulsay and J Jeyadevi

4. Disaster Mitigation: Experiences & mitigations by Pradeep Sahni, Alka Dhameja, Uma Medury

5. Disaster Management at Health care settings by Shreen Gaber