VEER NARMAD SOUTH GUJARAT UNIVERSITY

SURAT

M. Sc. ENVIRONMENTAL SCIENCE

SYLLABUS (CBCS)

With Effect from 2019-20

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
M.Sc. Environmental Science
FOURTH SEMESTER

Ens 401 : Instrumentation in Environmental Analysis-II

Total Hours: 48

1	**Gas Chromatography**	**12 Hours**
1.1	Introduction of chromatography and principle of separation	
1.2	Classification -GSC and GLC & its applications	
1.3	Components of instruments: carrier gas, sample injection system, stationary and mobile phase	
1.4	Columns - packed column and capillary column - WCOT, SCOT, PLOT	
1.5	Detectors - FID , TCD, ECD , ASD	
1.6	Principle and applications of GC-HS, GC-MS	
2	**High Performance Liquid Chromatography**	**12 Hours**
2.1	Introduction, principle and types of HPLC	
2.2	Components of instruments: pumps high pressure, pneumatic, syringe, reciprocating, hydraulic	
2.3	Sample injection system	
2.4	Column	
2.5	Detector: ultra violet light absorption , refractive index, evaporative light scattering	
2.6	Selective applications in separation and estimations	
2.7	Principle and applications of LC-MS	
3	**Ion Exchange Chromatography**	**12 Hours**
3.1	Ion exchangers - characteristics and properties	
3.2	Types of ion exchangers	
3.3	Synthesis and working of cation and anion exchange resins	
3.4	Ion exchange equilibrium and factors affecting it	
3.5	Instrumental set up of IEC- columns and detector	
3.6	Principle and procedure of IEC	
3.7	Applications	
4	**Chemical Sensors**	**12 Hours**
4.1	Definition and classification of sensors	
4.2	Signal and noise, efficiency of sensors	
4.3	Principle and applications of	
4.3.1	Electrochemical sensors	
4.3.1.1	Coulometry & Potentiometry	
4.3.1.2	Conductimetry & Amperometry	
4.3.1.3	Polarography & Voltammetry	
4.3.2	Solid state electrode sensors	
4.3.3	Optical sensors	
4.3.4	Thermal sensors	
4.3.5	Mass sensitive sensors	

References:

1. BIOS-Instant Notes-Analytical Chemistry, D. Kealey, P.J. Haines, 2002, Viva Books (P) Ltd.
2. Handbook of Analytical Instrument, R.S. Khandpur,2nd Edition, Reprint 2009, Tata McGraw Hill Publishers.
3. Instrumental Methods of Chemical Analysis (Analytical Chemistry) , H. Kaur, 8th Edition, 2012, Pragati Prakashan.
4. Basic Concepts of Analytical Chemistry, S.M. Khopkar, 3rd Edition, Reprint 2009, New Age International (P) Limited, Publishers.
5. Analytical Instrumentation Handbook, Ewing's , Edited by Jack Cazes, 3rd Edition, 2005, Marcel Dekker Publisher.
6. Instrumental Methods of Analysis, H.H.Willard, L.L.Meritt, J.A. Dean and F.A. Settle, 7th Edition, 1986, CBS Publishers.
7. Instrumental Methods of Analysis, B.K. Sharma, 24th Edition, 2005, Goel Publishing House.
8. Instrumental Analysis, D.A. Skoog, D.M. West, F.J. Holler and S.R. Crouch, 11th Edition, Reprint 2012, Cengage Learning.
9. Analytical Instrumentation, Bela G. Liptak, 1st Edition,1994, 1st Indian Reprint, 2012, Chilton Book Company.

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M.Sc. Environmental Science
FOURTH SEMESTER

Ens 402: Environmental Toxicology and Nanotechnology

Total Hours: 48

1	**Toxicology of Heavy Metals**	**12 Hours**
1.1	Toxic chemicals in the environment: classification	
1.2	Impact of toxic chemicals on enzymes	
1.3	Biochemical effects and toxicology of	
1.3.1	Cadmium	
1.3.2	Lead	
1.3.3	Arsenic	
1.3.4	Mercury	
2	**Toxicology of Hazardous Chemicals**	**12 Hours**
2.1	Biochemical effects and toxicology of	
2.1.1	Ozone & Peroxy Acetyl Nitrate	
2.1.2	Cyanide	
2.1.3	Methyl Iso Cyanate (MIC)	
2.1.4	Pesticides	
2.2	Preventive measures to protect environment	
2.3	Better industrial process	
2.4	Industrial ecosystem	
3	**Fundamentals of Nanotechnology**	**12 Hours**
3.1	Introduction to nanotechnology	
3.2	Concept and principle of bionanotechnology	
3.3	Biological engines	
3.4	Nanometers of biological systems	
4	**Nanotechnology for Environmental Development**	**12 Hours**
4.1	Remediation: nanosized metal oxides for remediation	
4.2	Photocatalysis	
4.3	Monitoring devices of pollutant	
4.4	Cytotoxicity of nanoparticles	

References:

1. Environmental Chemistry: Stanley. E. Manahan, 10th Edition, 2017, CRC Press.
2. Environmental Chemistry: A. K. De, 7thedition, 2018, New Age International Publisher
3. Environmental Chemistry: Sameer K. Banerjee, 2nd Edition, 2005, Prentice Hall of India Pvt. limited.
4. Chemistry of Environmental Engineering and Science, C. N. Sawyer and P. L. Mc Carty, 5th Edition, 2003, 21st Reprint, 2015, McGraw Hill Education (India) Pvt. Ltd.
5. Environmental Chemistry, B. K. Sharma, 16th Edition, 2016, Goel Publishing House
6. Environmental Chemistry - H. Kaur, 8th Edition, 2014, Pragati Prakashan.
7. Bionanotechnology: Concepts and Application, Madhuri Sharon; Maheshwar Sharon, 1st Edition, 2013, Ane Books Pvt., Ltd.
8. Nanotechnology: A future technology with visions, Author: Appin Labs-team, 1st Edition, 2007, BPB publication.
9. Nanotechnology, R.K.Yadav, 1st Edition, 2007, Manglam Publisher.

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FOURTH SEMESTER

Ens. 403: Environmental Disasters and Risk Management

Total Hours:48

1	**Hazards in the Environment**	**14 Hours**
1.1	Hazards, risk and disasters	
1.2	Current views: the complexity paradigm	
1.3	Phases of disaster	
1.4	Explaining, measuring and managing disaster	
2	**Natural Disasters**	**14 Hours**
2.1	Types of natural disasters	
2.2	Natural disasters and medicine	
2.3	Natural disaster: awareness and education	
2.4	Natural disaster reduction: global concern	
3	**Risk Assessment and Management**	**10 Hours**
3.1	Nature of risk and assessment	
3.2	Risk perception and its' communication and practice	
3.3	Risk management	
3.4	Role of information technology in risk assessment and management	
4	**Reducing the Impact of Disaster**	**10 Hours**
4.1	Protection: hazard resistance	
4.2	Mitigation: disaster aid and insurance	
4.3	Adaptation: preparedness, predictions, forecasts and warnings	
4.4	Adaptation: land use planning	

References:

1. Environmental Hazards: Assessing risk and reducing disaster, Keith Smith, 6th Edition, 2013, Routledge, Taylor and Francis group.
2. Towards Basics of Natural Disaster Reduction, D.K.Sinha, 1st Edition, 2006, Researchco.
3. Disaster Management, V.K.Sharma, 2nd Edition, 2013, Medtec-An imprint of Scientific International Pvt. Ltd.
4. Environmental Health, Assessing Risk and Reduction Disaster, Smith, K. 3rd Edition, 2001, Routledge.
5. Disaster Management, Mukesh Kapoor, 1st Edition, 2010, Saurabh Publishing House.
6. Disaster Management and Preparedness, Judah Carter, 1st Edition, 2017, Syrawood Publishing House.
7. Handbook of Disaster Risk Reduction & Management**,** Christian N Madu and Chu-Hua Kuei, 1st Edition, 2017, World Scientific.
8. World Famous Disasters, Narendra Malhotra, 1st Edition, 2004, Jain Book Depot.
9. Natural Disasters, R.K. Sharma and Gagandeep Sharma, 1st Edition, 2005, Jain Book Depot.

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Ens. 404: Environmental Management, Legislation and Policy

Total Hours: 48

1	**Environmental Management**	**12 Hours**
1.	ISO: 14000 Environmental Management Systems	
1.1	ISO 14001:Environmental Management Systems (EMS) and requirements	
1.2	Step by step preparation for EMS certification	
1.3	ISO 14004 guidance documents, ISO 14010 audit standards, ISO 14020 labeling standards	
2.	**Environmental Impact Assessment (EIA) &Environmental Audit (EA)**	**12 Hours**
2.1	Introduction-purpose and goal, methodology of EIA	
2.2	Environmental risk assessment - EIA of hazardous waste	
2.3	Role of EIA in sustainable development- limitations of EIA	
	Environmental Audit (EA)	
2.4	Introduction: Audit practices in developed countries and India	
2.5	Range of Audit objectives - Audit methodology	
2.6	EA report - preparation according to format	
2.7	Benefits of Environmental Audit	
3.	**Environmental Legislation-I: Objectives and Provisions of Acts**	**12 Hours**
3.1	Introduction and international concern for environment	
3.2	Environment protection laws in India- the regulatory structure	
3.3	Constitution of central and state pollution control board	
3.4	Power and functions/duties, penalties for violations of the provisions of the acts of pollution control board for:	
3.4.1	The Indian Forest Act, 1927	
3.4.2	Indian Wildlife (Protection) Act, 1972	
3.4.3	The Water (Prevention and Control of Pollution) Act, 1974	
3.4.4	The Air (Prevention and Control of Pollution) Act 1981	
3.4.5	The Environment (Protection) Act, 1986	
3.4.6	The Motor Vehicle Act, 1988	
3.4.7	The Biodiversity Act, 2002	
4.	**Environmental Legislation-II: Objectives and Provisions of Rules**	**12 Hours**
4.1	Municipal Solid Waste (Management and Handling Rules), 2000, 2016, Plastics Manufacture, Sale and Usage Rules, 2011 Recycled Plastics Manufacture and Usage Rules, 1999	
4.2	The Hazardous Wastes (Management, Handling and Trans boundary Movement) Rules, 2008	
4.3	Bio-Medical Waste (Management & Handling) Rules,1998	
4.4	E-waste Management and Handling Rules 2011	
4.5	Noise Pollution (Regulation and Control) Rules, 2000	
4.6	Wetland Rules 2009	
4.7	Coastal Regulation Zones (CRZ) Rules, 2011.	

References:

1. Environmental Law Case Book, Leelakrishnan P., 2nd Edition, 2006, 4th Reprint, 2015, LexisNexis.
2. Shantakumar's Introduction to Environmental Law, Shantakumar S., 2nd Edition, 2005, LexisNexis.
3. Handbook of Environmental Law in India, Sahasranaman P. B., 2nd Edition, 2012, Oxford University Press (India).
4. Environmental Engineering & Management, S.K. Dhameja, 1st Edition, 2005, Kataria Publication.
5. Environmental Studies, S.K. Dhameja, 1st Edition, Reprint, 2017, Kataria Publication.
6. Environmental Protection, Law and Policy, **Jane Holder, Maria Lee,** 2nd Edition, 2012, Cambridge University Press.
7. Environmental Law and Policy, Stephen R. Chapman, 1st Edition, 1997, Prentice Hall.
8. Environmental Law-An Introduction, Nawneet Vibhav, 2nd Edition, 2017, LexisNexis.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
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FOURTH SEMESTER

Ens 405-Dissertation
OR
Ens 405-A Review of Research Article
Ens 405-B Seminar

Total Hours: 96

Dissertation/Review of Research Article/Seminar can be carried out on any subject related to Environmental science and technology under guidance and supervision of respective teacher.

It includes all guidelines related to:

- Topic selection for Dissertation/Review of Research Article/Seminar.
- Literature work for the subject.
- Its theoretical concept and experimental work in laboratory in case of Dissertation.
- Thesis writing in format and Power point presentation preparation.
- Continuous evaluation of all the above mentioned tasks.
- Final checking of Thesis and Power point presentation.
- Submission of Thesis and Power point presentation.