

MSc in Environmental Sciences with a Minor in Remote Sensing & Geographical Information Systems (RS & GIS)

SEMESTER-I

Sl. No	Course Code	Course Name	L-T-P	Credits
1	22ENV501	Introduction to Ecology and Environmental Sciences	3-0-0	3
2	22ENV502	Environmental Chemistry	4-0-0	4
3	22ENV503	Natural Resource Conservation and Management	4-0-0	4
4	21CUL501	Cultural Education	2-0-0	P/F
5	22ENV504	Biodiversity Conservation Management	3-0-0	3
6	22ENV505	Environmental Geology	3-0-0	3
7	21SSK501	Life skills	0-0-3	P/F
8	22ENV506	Solid Waste Management	4-0-0	4
9	22ENV581	Lab I: Ecological Studies and Biodiversity Estimation	0-0-2	1
		Total Credits		22

SEMESTER-II

Sl. No	Course Code	Course Name	L-T-P	Credits
1	22ENV511	Environmental Microbiology	2-0-0	2
2	22ENV512	Environmental Biotechnology	2-0-0	2
3	22ENV513	Introduction to Remote Sensing & Geographical Information Systems	4-0-0	4
4	22ENV514	Environmental Analytical Techniques and Instrumentation	4-0-0	4
5	22ENV515	Disaster Prediction and Management	3-0-0	3
	22ENV516	Environmental Pollution Control	4-0-0	4
6	21AVP501	Amrita Values Program	1-0-0	1
7		Open Elective	2-0-0	2
8	22ENV582	Lab -II: Environmental Microbiology	0-0-2	1
9	22ENV583	Lab III: Environmental Pollution Analysis	0-0-3	1
10	22AVP103	Mastery Over Mind	1-0-2	2
		Total Credits		26

SEMESTER-III

Sl. No	Course Code	Course Name	L-T-P	Credits
1	22ENV601	Environmental Impact Assessment & Management Systems	3-0-0	3
2	22ENV602	Environmental Ethics, Laws, and Policy	3-0-0	3
3	22ENV603	Environmental Toxicology	3-0-0	3
4	22ENV604	Surveying	3-0-0	3
5	22ENV605	Geospatial Applications for Environment Management	4-0-0	4
6		Core Elective	3-0-0	3
7	22ENV681	LAB-III: GIS Lab - I Surveying And Cartography	0-0-2	1
8	22ENV682	LAB -IV : GIS Lab II Remote Sensing and Image Processing	0-0-3	1
		Total Credits		21

SEMESTER-IV

Sl. No	Course Code	Course Name	Credits
	22ENV699	Dissertation	14

CORE ELECTIVES

22ENV631	GREEN CHEMISTRY	(3-0-0-3)
22ENV632	ENVIRONMENTAL APPLICATIONS OF NANOTECHNOLOGY	(3-0-0-3)
22ENV633	ENVIRONMENTAL HEALTH PERSPECTIVES	(3-0-0-3)
22ENV634	ECOTOURISM	(3-0-0-3)
22ENV635	SUSTAINABLE MANAGEMENT SYSTEMS	(3-0-0-3)
22ENV636	GREEN PRODUCT DESIGN	(3-0-0-3)
22ENV637	RENEWABLE ENERGY RESOURCES	(3-0-0-3)
22ENV638	INDUSTRIAL SAFETY AND HAZARD ANALYSIS	(3-0-0-3)
22ENV639	ADVANCED STATISTICAL METHODS	(3-0-0-3)

OPEN ELECTIVES

Course Code	Course Title	L – T – P	Cr.	ES
21OEL631	Advanced Statistical Analysis for Research	2 0 0	2	D/E
21OEL632	Basics of PC Software	2 0 0	2	D/E
21OEL633	Computer Hardware and Networking	1 0 1	2	D/E
21OEL634	Consumer Protection Act	2 0 0	2	D/E
21OEL635	Corporate Communication	2 0 0	2	D/E
21OEL636	Design Studies	2 0 0	2	D/E
21OEL637	Disaster Management	2 0 0	2	D/E
21OEL638	Essentials of Cultural Studies	2 0 0	2	D/E
21OEL639	Foundations of Mathematics	2 0 0	2	D/E
21OEL640	Foundations of Quantum Mechanics	2 0 0	2	D/E
21OEL641	Glimpses of Life through Literature	2 0 0	2	D/E
21OEL642	Information Technology in Banking	2 0 0	2	D/E
21OEL643	Knowledge Management	2 0 0	2	D/E
21OEL644	Marketing Research	2 0 0	2	D/E
21OEL645	Media for Social Change	2 0 0	2	D/E
21OEL646	Media Management	2 0 0	2	D/E
21OEL647	Object-Oriented Programming	2 0 0	2	D/E
21OEL648	Painting and Sculpture	1 0 1	2	D/E
21OEL649	Personal Finance	2 0 0	2	D/E
21OEL650	Principles of Advertising	2 0 0	2	D/E
21OEL651	Principles of Packaging	2 0 0	2	D/E
21OEL652	Scripting for Rural Broadcasting	1 0 1	2	D/E
21OEL653	Social Media Website Awareness	1 0 1	2	D/E
21OEL654	Theatre Studies	1 0 1	2	D/E
21OEL655	Writing for Technical Purposes	2 0 0	2	D/E
21OEL656	Yoga and Personal Development	1 0 1	2	D/E
21OEL657	Fundamentals of Legal Awareness	2 0 0	2	D/E

1. Specific Regulations to be included, if any

Nothing Specific

2. Essential Resources (Needed, Available, to be created & when)

The labs of the Chemistry department can be used for the Environmental Sciences lab, also the courses can be handled by existing faculty members of different departments like Chemistry, Physics, Biotechnology, Microbiology, Cultural education, and CIR. Need one lab for Remote Sensing & Geographical Information systems after the completion of the first semester of the proposed course. For engaging classes and labs of RS & GIS need a faculty with expertise in RS & GIS field.

Resources Available: Chemistry Labs and courses can be managed with existing faculty members from different departments of ASPS (Amrita School of Physical Sciences) & ASB (Amrita School of Biotechnology) Departments.

Resources Needed: One faculty with specialization in Environment Science and one GIS & RS expert with an expertise in Natural Resource Management for environmental Applications to engage GIS classes, labs, field visits, and projects. Need Remote Sensing and Geographical Information Lab.

Resources Created & Timeline: One GIS & RS expert after the first semester of the initiation of the proposed course

3. Does the start of the Program need the approval of any Statutory Body / Council?

YES

4. Details of few other Universities / Institutions offering similar programs:

MSc Environmental Science – Banaras Hindu University

MSc Environmental Science – Parul University

MSc Environmental Science – Amity University, Noida.

MSc Environmental Science – Aligarh Muslim University.

MSc Environmental Science – S.S. Jain Subodh PG College.

MSc Environmental Science - Jawaharlal Nehru University.

MSc Environmental Science – IIT Bombay - Indian Institute of Technology.

MSc Environmental Science – Rayat Bahra University.

MSc Environmental Science – School of Basic Sciences and Research (SBSR), Sharda University.

MSc Environmental Science & Management – Mahatma Gandhi University

MSc Environmental Science – Kerala University

MSc Environmental Science – Calicut University

ANNEXURE -I

MSc in Environmental Science with a minor in Remote Sensing & Geographical Information Systems (RS& GIS)

Programme Outcomes (POS)

Students are trained to acquire a broad base of fundamentals and thorough knowledge of all environmental aspects, including the different spheres in the universe like the atmosphere, hydrosphere, lithosphere, and biosphere.

Students will be able to explore new areas of research in both environmental sciences, remote sensing, and Geographical Information Systems which are useful for natural resource management.

It trains students in solving fundamental problems of environmental science and engineering and makes them capable of finding technological, social, and scientific solutions.

Students will be able to excel in careers or pursue advanced degrees for careers in R&D, NGOs, academia, and industry.

The students will be equipped to demonstrate a high level of professionalism, social and ethical responsibility, team-working, and presentations to develop their personal skills, independent learning in problems related to the environment.

DETAILED SYLLABUS

22ENV501 Introduction to Ecology and Environmental Sciences (3-0-0-3)

Course Outcomes (COs)

The course is designed to gain an understanding of the concept and scope of Environmental Science

To make students understand the structural and functional aspects of ecosystems

The course introduces the students to topics related to biomes and habitats, ecosystem dynamics, the evolution of ecosystems, ecological interactions, population dynamics, and limiting factors of the environment

This course helps to understand the concept of sustainability, principles, and objectives of environmental education

Course Content

Unit 1 Introduction:

Concept and scope of environmental science, definition, scope, and importance, need for public awareness, environmental biology, abiotic and biotic factors, segments of the environment, biomes, and habitats: classification of biomes. types of ecosystems, terrestrial ecosystems, ecosystem services, economic value of ecosystem services.

Unit II Ecosystem Dynamics:

Concept of an ecosystem, structure, and function of an ecosystem, producers, consumers and decomposers, energy flow in the ecosystem, food chain, food web, ecological pyramids,

ecological succession, primary and secondary succession, allogenic and autogenic succession, ecosystem modeling

Unit III History of Environmental Sciences:

Environmental history, environmental movements, international, national perspectives environmental education, environmental legislation in India, constitutional provisions for environmental protection, overview of international treaties, and conventions on the environment.

Unit IV Biogeochemical Cycles and Ecological Interactions:

Development and evolution of ecosystems, biogeochemical cycles, gaseous and sedimentary cycles, human interactions on nutrient cycles. ecotone, edge effects, ecological niche, and ecosystem stability. Ecological interactions, neutralism, symbiosis, commensalism, mutualism, antagonism, antibiosis, parasitism, prelatism, competition.

Unit V Population Dynamics:

Concept of population, population growth, density, natality, mortality and growth curves, life curves, age structure, function, and equilibrium; population regulation, biotic potential, and environmental resistances; factors of population regulation, the concept of carrying capacity, the laws of population growth, factors of population regulation.

Unit II Ecosystem Dynamics:

Concept of an ecosystem, structure, and function of an ecosystem, producers, consumers and decomposers, energy flow in the ecosystem, food chain, food web, ecological pyramids, ecological succession, primary and secondary succession, allogenic and autogenic succession, ecosystem modeling

Unit VI Sustainable Development & Environmental Education:

Concepts and growth of the idea, indications of sustainable development, models of sustainable development, sustainable development scenario- global, national, UN Sustainable developmental goals. environmental education: Meaning and scope, principles, and objectives; environmental awareness strategies; formal and non-formal education; action plans.

REFERENCES

1. Botkin, Daniel B. 2011. *Environmental Science: Earth as a Living Planet*, John Wiley and Sons, New Delhi.
2. Chapman, J.L. and Reiss, M. J. 2005. *Ecology Principles and Application*, Cambridge University Press, London.
3. Dash, M.C. 1994. *Fundamentals of Ecology*, Tata Mc Graw Hill, New Delhi
4. Gunther, O. 1998 *Environmental Information Systems*. Berlin, New York, Springer.
5. Miller G. Taylor and Scott Spool man. 2011. *Essentials of Ecology*, Brooks/Cole Learning, USA.
6. Odum, E.P. 1971. *Fundamentals of Ecology*, W.B. Saunders Company, Philadelphia.
7. Sharma. P.O. 1996. *Environmental Biology*, Rastogi Publications, Meerut.
8. Verma. P.S. and V.K. Agarwal. 1985. *Principles of Ecology*. S. Chand and Company, New Delhi.

22ENV502

Environmental Chemistry

(4-0-0-4)

Course Outcomes (COs)

The students would be trained to acquire a broad base of fundamentals of all environmental systems, including the different spheres in the universe like the atmosphere, hydrosphere, lithosphere, and biosphere.

This course will help the students to understand heavy metals and persistent organic pollutants and their impact on humans.

This course will provide an overview of different types of pesticides, their actions, and their fate, on the environment.

It will also aid the students to understand the chemistry of biologically important molecules.

Course Content

Unit I Atmospheric Chemistry:

Concept and scope of environmental chemistry, regions of the atmosphere stratospheric chemistry, chlorofluorocarbons, ozone depletion, oxygen and ozone chemistry, stratospheric chemistry: The chemistry of ground level air pollution, greenhouse effect, global warming, climate change and its consequences, minimizing future emissions of greenhouse gases. tropospheric chemistry, the principle of reactivity in the troposphere, the tropospheric oxidation of methane, photochemical smog, rain, snow, and fog chemistry, formation and composition of acid rain, atmospheric aerosols, oxidation of atmospheric SO₂, chemistry of the urban and indoor atmosphere.

Unit II Water Chemistry:

Water resources, distribution of species in aquatic systems, gases in water, organic matter in water, chemistry and composition, seawater and freshwater, pH and PE diagrams, complexation in natural and freshwater.

Unit III Soil Chemistry:

Soil formation, factors controlling soil formation: soil profile, classification of soil, composition of soil, water, air and, soil, micro and macronutrients, soil physical and chemical properties, acid-base and ion exchange reactions in soil, wastes, and pollutants in soil, hazardous wastes and contamination of soils and sediments.

Unit IV Heavy Metals and Persistent Organic Pollutants:

Organic compounds: Classification, degradation, analysis, pollution due to pesticides, Minamata disease, Itai-Itai. Organochlorine pesticides, structure of DDT, bioaccumulation, and biomagnification. Organophosphates and carbamate insecticides, endosulphan issue, natural and green insecticides, sources, target insects, integrated pest management. Heavy metals: heavy metals speciation and toxicity of heavy metals. Organic compounds of environmental concern: dioxins, furans, poly chlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs) – sources, health impacts.

Unit V Radioactive Pollution:

Types of radiation, measurements of radioactivity, radioactive nucleus decay, radon from U238 decay sequence; nuclear accidents and their health and environmental impacts, case studies.

REFERENCES

1. *Dorling Kindersley. 2015. Dire Predictions: Understanding Climate Change, 2nd Ed. ISBN 978-1-4654-3364-0*
2. *Archer, David .2012. Global Warming: Understanding the Forecast, 2nd Ed., Wiley ISBN 978-0-470-94341-0*
3. *Kerry Emanuel. 2018. What We Know about Climate Change, Updated Edition, MIT Press, ISBN: 9780262535915*
4. *Baird, C. And Cann, M. 2005. Environmental Chemistry. W.H. Freeman and company, New York (Pub)*
5. *Manahan, S. E. 1999. Environmental Chemistry. Lewis Publishers, U.S.A.*
6. *Dara, S.S. 1993. A textbook of Environmental Chemistry and Pollution Control. S. Chand, New Delhi*
7. *Armikar, H. J.1995. Essentials of Nuclear Chemistry. New Age International, New Delhi*

8. *Lehninger, A. L. 1984. Principles of Biochemistry CBS Publishers and Distributors, Delhi*
9. *Hamir S. Rathor. 2012. Pesticides: Evaluation of Environmental Pollution by CRC Press*
10. *Lenihan, J. M. A. And Fletcher W.W. 1976. Energy Resources and the Environment. Academic Press*

22ENV503 Natural Resource Conservation and Management

(4-0-0-4)

Course Outcomes (COs)

This course aims to equip students with the necessary knowledge and skills in the areas of natural resources and their management.

The interdisciplinary nature of this course allows students to learn about the conservation and management of a variety of natural resources.

This subject helps the students to cater to the rising demand for environmental managers in the field of environment, energy, and sustainability.

Students can appreciate the importance of energy efficiency and energy conservation strategies for a sustainable environment.

Course Content

Unit I Land Resources:

Concepts and major types of natural resources, land resources; land use and land cover, land-use change, drivers of land-use change, and the impact of land use on the environment.

Unit II Water Resources:

Global distribution and extent: global, national, and regional, types, water availability and uses, freshwater shortages, the impact of climate change on freshwater resources, management, and conservation of water resources. Watershed management: concepts, objectives, planning, and measures; land use planning for watershed management; water harvesting and recycling; flood control and watershed management; socio-economic aspects of watershed management.

Unit III Energy Resources:

Energy use pattern in various parts of the world and its impact on the environment; energy use pattern in India, sources of energy and their classification; fossil fuels: classification; energy content of coal, petroleum, and natural gas; exploration/mining, impacts on the environment, geothermal energy, renewable energy options: Solar, wind, wave, tidal, OTEC, problems, merits & demerits, management options

Unit IV Forest Resources:

Overview of major forest types in India with special reference to Kerala, their characteristics; social forestry, community participation, initiatives in India for the eco restoration of degraded land, agro-forestry: origin and definition, types; tree and crop management, models for hill farming, three-tier system, tree, green hedge, crop farming system, forest management, social forestry, and integrated development program.

Unit V Mineral and Soil Resources:

Overview of major soil types and mineral deposits of India with special reference to Kerala; acidic, alkaline, and saline soils, reclamation/remediation techniques.

REFERENCES

1. *Daniel, D. Chiras and Reganold, John, P. 2009. Natural Resource Conservation: Management for a Sustainable future, Addison Wesley, Boston*
2. *Thapar, S. D. 1975. India's forest Resource, Macmillan India, New Delhi.*

3. *Rajora Rajesh. 1998. Integrated Watershed Management: A Field Manual for Equitable, Productive, and sustainable Development, Rawat Publications, Jaipur.*
4. *Abbasi, S. 1997. Wetlands of India: Ecology and threats; Discovery Publishing House, New Delhi.*
5. *Kesler, P. 2002. Mineral Resources: Economics and Environment, CBS Publishers and Distributors, New Delhi*
6. *Ghosh, S.K and Singh, R. 2003. Social forestry and Forest Management, Global Vision Publication, New Delhi.*
7. *Dwidei, A.P. 2003. A textbook of Silviculture. International Book Distributors, Dehradun.*
8. *Jha, L. K. 1995. Advances in Agroforestry, APH Publication Corporation, New Delhi.*
9. *Biswas, A.K. 2007. Water resources: Environmental Planning, Management, and Development, McGraw – Hill, New Delhi.*
10. *Fai Fung, C and Ana Lopez, Mark eds. 2011. Modeling the impact of climate change on water resources, Wiley Blackwell.*
11. *Boyle, G. Bob Everett, and J. Ramage. 2003. Energy System and Sustainability, Oxford University Press, New York.*
12. *Sudhakara Reddy, B.P. Balachandra, 2006. Energy, Environment and development, Narosa Publishing House Pvt. Ltd., New Delhi.*

22ENV504

Biodiversity Conservation and Management

(3-0-0-3)

Course Outcomes (COs)

This course will help the students to get an overall picture of the importance, threats, and conservation methods of biodiversity.

It will help to gain knowledge about the resource availability and problems related to marine ecosystems.

Also, it will help the students to deal with sustainable options for Coastal Zone Management.

Course Content

Unit I Biodiversity:

Introduction, levels, benefits and threats to biodiversity, hotspots of biodiversity, gene pool, climate, and its impact on the biodiversity of flora and fauna; endemic, endangered, and threatened species; IUCN threatened species of plants and animals; Red Databook.

Unit II Biodiversity Conservation:

Methods of conservation, in-situ and ex-situ methods, sustainable exploitation strategies for conservation; international and national efforts for the conservation of biodiversity, RAMSAR sites, CBD quarantine regulations; Biodiversity Act, IPRs; Biopiracy and, effect; protection of wildlife, the role of both governmental and NGOs in conservation with emphasis on SACON, WWF, WCU, CITES, TRAFFIC.

Unit III Marine Ecosystem:

General characteristics of ocean, classification of oceanic environment, exploration, survey tools and methods, navigation, and positioning systems. Coral reefs: importance of coral reefs, threats, and conservation. Marine pollution: causes and management, oil spills: problems and solutions, effect of climatological factors on the marine ecosystem, coastal development, mangroves, seaweeds aquaculture, fishing, salt pans.

Unit IV: Coastal Zone Management:

Importance of coast: coastal forms and process, depositional landforms, long-shore drifts, coastal Management, coastal protection, beach management, dune stabilization, controlling coastal hazards, impact of eco-tourism on coastal flora and fauna, Coastal Regulation Zone (CRZ) and LEZ.

Unit V: Wetland Ecosystems:

Wetlands, concept, classification, importance, uses and threats to the wetlands, productivity, and development of wetlands, Ramsar convention, and National Wetland Policy.

REFERENCES

1. Talley L.D., Pickard G.L., Emery W.J., Swift J.H. 2011. *Descriptive Physical Oceanography: An Introduction* - Elsevier, Boston, 560 pp.
2. Ambast R S .2003. *Modern Trends in Applied Aquatic Ecology*. Springer
3. Sen Gupta R and Desa E, 2001. *The Indian Ocean. A Perspective. I and II*. Oxford & IBH Publishing Co. Pvt Ltd.
4. Levinton J. S. 2008. *Marine Biology: Function, Biodiversity, Ecology*. Oxford University Press UK.
5. Tamminen, T and Kuosa H. 1996. *Eutrophication in planktonic Ecosystems: Food Web Dynamics and Elemental Cycling*. Springer
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7. Allan J.D. 2007. *Stream Ecology: Structure and Function of Running Waters*. Springer
8. Keddy P.A. 2000. *Wetland Ecology: Principles and Conservation*. Cambridge University

22ENV505

Environmental Geology

(3-0-0-3)

Course Outcomes (COs)

This course aims at providing students with an improved understanding of the physical earth, geological processes, geological resources, and environmental geology.

This will help to use geologic information to solve conflicts in environmental science to minimize environmental degradation and maximize the beneficial results of using our natural and modified environments.

Course Content

Unit I Introduction:

Origin and evolution of the earth; geological time scale. Plate tectonics, seafloor, and continental drift; forces acting on the surface of the earth, tectonic and diastrophic forces, the study of the interior of the earth: crust, mantle, and core.

Unit II Rocks and Minerals:

Definition of minerals. Physical properties of minerals; a brief overview of the formation, forms, textures, structures, classification of igneous, sedimentary, and metamorphic rocks. Environmental impacts of mining and various mitigatory measures.

Unit III Earth's Surface Processes:

Weathering of rocks, physical, chemical, and biological; erosion, transportation, and deposition of earth's materials by streams, wind, and glaciers, development of landforms. Soil: Factors affecting soil formation; chemical and mineralogical, physical properties of soil: texture, bulk density, permeability; chemical properties, cation exchange capacity (CEC), SOC, pH, macro, and micronutrients

Unit IV Natural Hazards:

Earthquake- causes, effects, distribution, and prediction; Volcanoes: types, distribution, products of volcanic eruption and its environmental impact, Landslides: slope stability, factors

affecting slope stability, causes, effects, and prevention of landslides; Tsunamis: causes, characteristics, effects. Mass movement of earth materials, landslides, definition, classification, causes of landslides and their corrections, Geological considerations in the selection of sites for reservoirs and dams; Floods: causes, types, effects. Prepare Case Studies in each category.

Unit V Hydrogeology:

Groundwater table, abundance, and advantages, aquifer, aquiclude, aquifuge, aquitard, artesian conditions and artesian wells-cone of depression perched water table, groundwater quality, and management, contamination sources, groundwater monitoring, mass transport of solutes, groundwater remediation.

REFERENCES

1. V.P. Singh, 1994. *Elementary hydrology*, Prentice – Hall of India.
2. Reghunath, H.M. 1996. *Hydrology – Principles, analysis, and design*, New Age international publisher.
3. K. N. Duggal and J. P. Soni, 1996. *Elements of water resource engineering*; New Age international publisher.
4. Strahler, A. N. and Strahler, A.H. 1987. *Physical Geography*.
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6. Read, H. H. *Rutley's Elements of Mineralogy*. John Wiley and Sons, New York.
7. Tyrell, G. H. 1948. *Principles of Petrology*.
8. Arthur Holmes, *Physical geology*, Thomas Nelson.
9. Parbin Singh, *Engineering & general geology*, K. Katria & sons, New Delhi.
10. H H. Read, *Rutley's elements of mineralogy*, George Allen & Unwin Ltd, London.
11. G.W. Tyrell, *Principles of petrology*, B.I. Publications, Mumbai.
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13. Krynine and Judd, *Engineering Geology & Geo techniques*, Tata McGraw Hill, New Delhi.
14. David Keith Todd, *Groundwater hydrology*, John Wiley & Sons, New York.

22ENV506

Solid Waste Management

(4-0-0-4)

Course Outcomes (COs)

This course will make the students aware of the processes involved in solid waste management.

It will train the students about the processing and management of different types of wastes like urban solid waste, electronic waste, hazardous waste, biomedical waste, etc.

Help the students to be aware of the legal provisions for solid waste management.

Course Content

Unit I: Solid Waste Management:

Classification of solid wastes, waste characteristics and quantitative estimation of municipal solid waste, factors affecting solid waste management, waste hierarchy, solid waste generation, storage, handling, transport, and disposal. Disposal Methods: (i) composting, (ii) sanitary landfill, (iii) waste to energy

Unit II: Waste Disposal Methods:

Dumping, sanitary landfill, leachate management for MSW landfills, Integrated waste management, TSDF for hazardous wastes, circular economy.

Unit III: Hazardous Waste Management:

Definition, types, and characteristics of hazardous waste, storage, handling, and transportation of hazardous waste, treatment, and disposal of hazardous waste (Common Hazardous Waste

TSDF), waste banks and waste exchange

Unit IV: Other Wastes and their Management:

Construction and demolition waste: definition, characteristics, treatment and disposal methods, Bio-medical waste: definition, characteristics, specific requirements for collection, storage, treatment, and disposal methods, E-Waste: definition, characteristics, dismantling, recovery, and disposal methods, Plastics waste: definition, characteristics, collection, treatment, recycling and disposal methods, Nuclear and radioactive waste: Management of nuclear waste

Unit V: Legal Provisions for Waste Management:

Solid waste management & handling Rules, 2016, hazardous & other wastes (Management & Transboundary Movement) Rules 2016 as amended upto 2021, e-waste management rules 2016 amended up to 2019, biomedical waste management rules 2019, plastic waste management rules, 2016, battery waste management, 2001, construction & demolition wastes rules, 2016

REFERENCES

1. *Abbasi, S.A and E. Ramasamy. 1999. Biotechnological Methods of Pollution Control, University Press, Hyderabad*
2. *Cunningham, W. P. 2001. Environmental Science, Global Science. McGraw Hill, London*
3. *Jayarama P. 2011. Municipal Solid Waste Management: Processing, energy recovery global examples, BSP Books Pvt Ltd. Hyderabad*
4. *Met Calf and Eddy. 1991. Waste Water Engineering, Tata Mc Graw Hill*
5. *Waste Water treatment Plan design. 1997, A manual of practice, Water Pollution Control Federation*
6. *Chereminsinoff, N.P. 1996. Biotechnology for waste and wastewater treatment, William Andrew Publishing, New York*
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11. *Peper, I. L., Gerba, C. P. & Brusseau, M. L. 1996. Pollution Science. Academic Press, San Diego.*
12. *Ramachandra. T.V.2006. Management of Municipal Solid Waste, Capital Publishing Company*
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14. *Tchobanoglous G, Rowe. R.D and Peavy. S.H. 1985. Environmental Engineering, International Edition, McGraw –Hill Book Co. Singapore*

22ENV511

Environmental Microbiology

(2-0-0-2)

Course Outcomes (COs)

The course is designed to provide a comprehensive introduction to both fundamental and applied aspects of environmental microbiology

The course aims at imparting an understanding of the basic and applied aspects of environmental microbiology and providing a comprehensive insight into the importance of microbes as key players in the various functions of the environment and in the degradation of wastes.

The course will provide information on microbial evolution and classification, microbial ecology and diversity, microbial degradation of pesticides and recalcitrant compounds, food and industrial microbiology, environmental microbiology, and microbial genetic engineering

Course Content

Unit I Microbial Groups:

Bacteria, fungi, algae, viruses, and protozoa; their place in the classification of the living world; their biology, nutrition, metabolism, and reproduction (General Treatment). Culturing of microorganisms: types and composition of culture media and sterilization, environmental selecting factors: physical factors (temperature and light, osmotic pressure, hydrostatic pressure), chemical factors (pH, O₂ and CO₂), diversity of microbial habitats: (air, soil and water), their general physical features.

Unit II Microbial Interface:

Competition for nutrients, oxygen, space, antibiosis (antibiotic and bacteriocins); inter microbial relationships, symbiotic relationships (mutualism, commensalisms, and parasitism), lichens, lysogeny, paramecium, chlorella association, bacteria, Virus association, Myco Viruses, Cyanophages, extra-microbial relationships, microbial ruminant association, microbial insect associations, microbial Higher plant associations (Mycorrhiza, Rhizobium, Legume association), microbial (bacterial, fungal and algal) toxins and their role in the environment.

Unit III Role of Microbes:

Role of microbes in: Nitrogen, Sulphur, Phosphorus, and Iron cycles, microbes in the recovery of minerals (bioleaching of minerals), In energy production: (Methane); Microbial biomass or single-cell protein production, Indicator organisms: Sanitary examination of water, IMVIC test, Environmental Biotechnology: Fermentation technology, Vermiculture technology, and Bio-fertilizer technology.

Unit IV Human Body as a Habitat for Microbes:

Body defensive mechanisms, concepts of the epidemiology of human microbial disease: Epidemics, pandemics, disease triangle, Sources of environmental pathogens: Living reservoirs, inanimate reservoirs, modes of pathogen transmission (direct transmission and indirect transmission), transmission through food, water, air, and biological vectors, some common diseases of humans: bacterial, boils and carbuncles, 'Strep' sore throat, Pneumonia, Tuberculosis, Cholera, Salmonellosis, Typhoid fever, anthrax, brucellosis, plague, syphilis, viral: smallpox, poliomyelitis, measles, hepatitis, encephalitis, rabies, fungal, dermatomycoses, systemic mycosis and protozoa, amoebiasis, malaria, environmental sanitation, and disease control.

REFERENCES

1. Paul Edmonds.1978. *Microbiology: An Environmental Perspective*. Mac Millan Publishing Co. Inc. New York.
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22ENV512

Environmental Biotechnology

(2-0-0-2)

Course Outcomes (COs)

The study of environmental genetics gives the details of the interaction between genetics and the environment.

It helps to educate the students about the recent concepts of biotechnology and can acquire knowledge for using the biological systems for remediation of contaminated environments and for eco-friendly processes.

The environmental genetics course gives the details of the expression of genetic information, mutation, and environmental mutagens.

This course introduces the student to the applications of biotechnology in environmental monitoring, waste management and pollution abatement, biodiversity conservation, and bioenergy production.

Course Content

Unit I: Introduction:

Environment and microbial forms (Algae, Fungi, Bacteria, viruses, Protozoa, worms, and larvae). Lichens as biological monitoring agents, Biotechnological methods of pollution detection based on microbes, plants, animal, and molecular systems, biosensors, Biotechnological methods in pollution abatement, removal of phosphorus, metals with plants and microbes, cell immobilization in waste treatment, mutants for specific wastewater.

Unit II: Techniques Used in Genetic Engineering and GM Organisms:

Polymerase Chain Reaction (PCR) and nucleic acid hybridization, genetically modified organisms in biological treatment, GMCs: cotton, maize, paddy, brinjal, use of nucleic acid waste and immunological methods for detection of specific groups of microorganisms and genes, use of fish for detection for a specific group of microorganisms in-situ.

Unit III: Genetically Engineered Organisms in Biodegradation of Pollutants and Eco-friendly Bioproducts:

Application of extremophiles (thermophiles, alkalophiles, acidophiles, halophiles, and psychrophiles) in pollution studies, production of enzymes like cellulase, proteases amylases in varied environmental conditions, biotechnology in biodegradation, bioremediation, case studies for bio-remediation with specific pollutant/compound, advanced biotechnological methods for safe environment, genetically engineered microbes in biotreatment of wastes, biosafety, eco-friendly bio-products: biopesticides, biofertilizers biodegradable plastics, biofuels: source and production technology of alcohols and biodiesel.

REFERENCES

1. Chatterjee A.K. 2002. *Introduction to Environmental Biotechnology*, Prentice Hall of India Private Ltd.
2. Click B.R. & Pasternak J.J. 2003. *Molecular Biotechnology, Principles, and application of recombinant DNA*, ASM Press.
3. Ausubel F. M., Smith. J.A, Moore D.D, Brent R., Seidman J.G.1999. *Short Protocols in Molecular Biology*, Wiley, John & Sons, Inc.
4. Anonymous .2007. *The New Science of Metagenomics: Revealing the Secrets of Our Microbial Planet: Committee on Metagenomics: Challenges and Functional Applications; National Research Council, National Academies Press.*
5. Dean J.R. 2007. *Bioavailability, Bio accessibility, and Mobility of Environmental Contaminants: John Wiley & Sons, Ltd.*

22ENV513 Introduction to Remote Sensing & Geographical Information Systems

Course Outcomes (COs)

This course will help to understand the basic concepts of Remote Sensing & Geographical Information Systems.

Students can gain experience in the applications of remote sensing and GIS to solve problems in the various branches of environmental sciences.

Students will be able to apply their knowledge and skills in spatial science to collect, map, analyze and present information about the physical environment.

The knowledge and skills acquired through this course train students for careers in the private, public, and non-profit sectors where there is an increasing demand for professionals with advanced technical skills in remote sensing and GIS are required to organize and analyze environmental data.

Course Content

Unit I Concepts and Foundation of Remote Sensing:

Basic processes in remote sensing, data acquisition, energy resources and radiation principles, propagation of energy through the atmosphere, energy interaction with earth's surface features, retransmission of energy into the atmosphere and generation of sensor data, data analysis.

Active and passive remote sensing; sensors, platforms, and scanners; principles of scanner and CCD array; specific features of remote sensing.

Unit II Aerial Remote Sensing:

Advantages of aerial remote sensing, elements of photographic systems, films, aerial cameras, filters. Classification of aerial photos and processes of aerial photos; elements of image interpretations, interpretation keys; interpretation of photographs and images for environmental analysis.

Unit III Photogrammetry:

Geometric characteristics of aerial photographs, the scale of photographs, stereo models; principles of stereo photography; relief displacement, parallax and measurement of height and slope, convergence and evidence, aerial mosaics, orthophotography, photogrammetric instruments.

Unit IV Types of Sensors:

Thermal, Multispectral, Microwave, Lidar: basic definition and principles, general characteristics, spectral resolution and interpretation, applications in environmental monitoring.

Unit V Satellite Remote Sensing:

Advantages of satellite remote sensing; types of satellite orbits, polar and geostationary; satellite characteristics: orbit, swath, resolution, scale. Overview of different satellites: sensors, geometry, radiometry, orbital characteristics, data products, and applications.

REFERENCES

1. Thomas, M.L and Ralph. W Kiefe. 1987. *Remote sensing and image interpretation*, John Wiley and Sons, New York
2. J.R. Jenson. 2013. *Remote Sensing of the Environment – An earth resource perspective*. Pearson Education
3. J.R. Jenson.2007. *Geographic Information System: Routledge*

4. Heywood.2011. *An introduction to GIS*, Pearson Publishers
5. N.K. Agaral, 2004. *Essentials of GPS*. Spatial Networks Pvt. Ltd. Hyderabad
6. Jhanwar, M.L and Chouhan, I.S.1998. *Remote sensing and Photogrammetry – Principles and Applications*
7. Narayan, L. R.A. 1999. *Remote Sensing and its Applications*. Universities press
8. Clarke, K.C.1997. *Getting started with Geographical Information System*. Prentice-Hall, New Jersey
9. Anji Reddi, M.2000. *Remote sensing and Geographic Information System*
10. Stephen Wise. 2002. *GIS basics*, Taylor and Francis, New York
11. Demers, Michael n. 1996. *Fundamentals of GIS*. John Wiley & Sons
12. Fisher Peter. 1995. *Innovations in GIS 2*. Taylor and Francis, New York
13. NPTEL Lectures

22ENV514 Environmental Analytical Techniques and Instrumentation (4-0-0-4)

Course Outcomes (COs)

The students can understand the physico-chemical methods for the analysis of soil, air, and water analysis

The students will get an overall idea about the principles, theory, and instrumentation of different instrumental methods of analysis

It will help students with the separation techniques and biological analysis

The students can understand the principles of field experiments and statistical methods of expressing the data

Course Content

Unit I Sampling and Sample Preparation:

Sampling of air, water, soil, and sediment, the chain of custody procedures, representatives of sampling sites, the grid method, sampling efficiency, sampling equipment, preparation, and preservation of samples for various parameters, selection of appropriate analytical techniques

Unit II Physico-chemical Parameters to Describe the Environmental Quality and Their Determination:

Regulatory and standard requirements for water, air, and soil quality: introduction to air and water quality standards as given in air (Prevention and Control of Pollution Act), 1981 and Water (Prevention and Control of Pollution Act) 1974. Description of various parameters prescribed for water quality performance, description of various parameters prescribed for air quality performance, description of various parameters prescribed for soil quality performance, introduction to consent to operate, and consent conditions.

Unit III Physico-Chemical Analysis & Separation Techniques in Environmental Quality Assessment:

Sample preparation, principles of titrimetry, gravimetry, colorimetry, spectrophotometry, spectrometry, atomic absorption, flame emission, and inductively coupled plasma mass emission spectrophotometry, and ion-selective electrode. Separation techniques: chromatography: paper, ion exchange, TLC electrophoresis: types and applications, gas chromatography, GC-MS environmental applications.

Unit IV Biological Analysis:

Primary productivity, collection, and identification of phytoplankton, microbes in the air, water, and soil, bacteria, fungi, actinomycetes, enumeration, isolation techniques, serial dilution, pour plate and spread plate, pathogens in air, soil, and water, bioindicators of

pathogens in drinking water/ surface water, analysis of coliforms, MPN techniques.

Unit V Principles of Field Experiments:

Randomization, replication and local control, layout, and analysis of data of CRD, RBD, Latin square designs, factorial designs, split-plot, and strip plot design. Computer applications in environmental research.

Unit VI Statistical Methods:

Measures of central tendency and dispersion, arithmetic mean, geometric mean and harmonic mean, measures of dispersion: standard deviation, mean deviation, the mean coefficient of variation, hypothesis testing, significance and correlation, linear models and regression, correlation coefficients, multiple regression difference among means, F test, one- and two-way ANOVA. Statistical software's, R, SPSS.

REFERENCES

1. APHA – AWWA, WPCF.2018. *Standard methods for the examination of Water and Wastewater*. Washington, D.C
2. CPCB, MOEF, *Guidelines for the Measurement of Ambient Air Pollutants Volume-I, National Ambient Air Quality Series: NAAQMS/36/2012-13*
3. CPCB, *Guidelines for Water Quality Monitoring, MINARS/27/2007-08*
4. Zar, Jerrold, H. 1998. *Biostatistical Analysis*, Prentice-Hall, NJ
5. Wayne R Ott. 1995. *Environmental Statistics and Data Analysis*, CRC Press
6. Manly.2001. *Statistics for Environmental Science and Management*, Chapman and Hall, CRC
7. Date, C.J. 1986. *An introduction to Database System*, Addison Wesley, UK
8. Medhi, J. 1992. *Statistical Methods*, Wiley Eastern, New Delhi
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10. Bender, G.T., W.K Saunders. 1972. *Chemical instrumentation. A laboratory manual base on Clinical chemistry*
11. Christian Gary, D. 2001. *Analytical Chemistry, 5th Edn. John Wiley & Sons, Inc. New York*

22ENV515 Disaster Prediction and Management

(3-0-0-3)

Course Outcomes (COs)

Students are trained to acquire a broad base of knowledge of disaster prediction and management.

It will help to understand various types of hazards like biological, chemical, physical, and psychological health hazards.

This course will equip the students with various aspects of health risk assessment and management.

This course will train students to cope with different disaster management activities like preparedness, prevention and thereby reduce or avoid the loss of human life and property

It will equip the students to work in collaboration with both governmental agencies and NGOs for Disaster Management Plan preparation.

Course Content

Unit I Introduction:

Definition, hazard, vulnerability, risk and disaster, classification of hazards, causative & triggering factors of hazards.

Unit II Natural and Human-Induced Hazards:

Earthquake, tsunamis, volcanoes, floods, landslides, avalanches, cyclones, drought, fire, zoonotic diseases, zoonotic influenza, salmonellosis, West Nile virus, plague, rabies, brucellosis, prediction, perception, mitigation, and management. Hazards due to dams and reservoirs, hazards due to nuclear power plants, industrial hazards, occupational hazards including chemical hazards, mitigation measures.

Unit III Mitigation of Risks:

Identification of hazard-prone belts, hazard zonation and risk assessment; risk reduction in vulnerable areas, developing warning systems, forecasting, emergency preparedness, education, and training activities, planning for rescue and relief works.

Unit IV Disaster Management:

Vulnerability, risk, preparedness, and mitigation; disaster management cycle, crisis management, and risk management. Components of crisis management, onsite and offsite emergency procedures, quick response and relief, recovery, rehabilitation; component of risk management, risk identification and assessment, risk reduction, risk transfer, management act, and, policy in the Indian context.

Unit V Environmental Health Hazard and Risk Assessment:

Biological, chemical, physical, and psychological health hazards; health risk assessment and management. Disaster management and components of disaster management plan, objective, emergencies organization, responsibilities, communication, facilities, action, information, Software's for disaster prediction.

REFERENCES

1. Sahni.D. and Medury 2001.*Disaster Mitigation, Experience, and Reflection, Prentice-Hall of India, New Delhi*
2. Murthy. R.K. 2004. *Disaster Management, Dominant Publishers, and Distributor*
3. Cutter, Susan, L. 1999. *Environmental Risks and Hazardous. Prentice-Hall of India, New Delhi*
4. Hill Mc Jurie, Ian Mason, and C. Kilburn. 2002. *Natural Hazards and Environmental Change. Oxford University Press, New York*
5. Gupta, Harsh K. 2003. *Disaster management, Universities Press (India) Pvt. Ltd*
6. Jha, Madhan Kumar. 2010. *Natural and Anthropogenic Disasters; Vulnerability, Preparedness and Mitigation, Springer.*
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8. *Techniques for Disaster Risk Management and Mitigation, John Wiley & Sons, Inc.*
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https://nidm.gov.in/PDF/pubs/NIDMBook_EnvServicesForHealth.pdf
10. *National Institute of Disaster Management, Mapping Climatic and Biological Disasters in India Study of Spatial & Temporal Patterns and Lessons for Strengthening Resilience. 2021.* https://nidm.gov.in/PDF/pubs/GIZNIDM_21.pdf
11. *National Institute of Disaster Management, Health Adaptation, and Resilience to Climate Change And Related Disasters A Compendium of Case Studies.2021.*
https://nidm.gov.in/PDF/pubs/NIDM_HealthAdaptation.pdf
12. *National Institute of Disaster Management, Water-related health Disasters (Floods& Droughts) Implications for health adaptation and resilience.2021.*
https://nidm.gov.in/PDF/pubs/NIDM_WRD2019.pdf

Course Outcomes (COs)

The course aims to acquire knowledge on the technology, principles, and techniques related to the reduction of emissions to air, land, and water and the effects of pollution.

It helps the students to get aquatint with the Engineering solutions to solve major environmental pollution problems.

This course helps to understand pollution meteorology.

Course Content

Unit I Wastewater Treatment:

Domestic and industrial; preliminary treatment, primary treatment, biological treatment: principles, stabilization pond, aerated pond, aerated lagoons, activated sludge process, trickling filter, anaerobic treatment, different models, the combination of attached and suspended growth, aerobic, anaerobic, and sequential treatment designs, constructed wetlands (Phytoremediation), common effluent treatment plants, advanced treatment methods.

Unit II: Water Quality Standards:

Specifications of drinking water (physical, chemical, and bacteriological) by BIS and WHO, packaged drinking water; drinking water treatment; collection and pumping, aeration, flocculation, sedimentation, filtration, disinfection, water softening; advance treatment methods: demineralization, ultra-filtration, reverse osmosis, color, and odor removal by activated carbon, arsenic, iron removal.

Unit III Air Pollution Control Measures:

Gaseous pollutants control by absorption, adsorption, and condensation, combustion. Limestone injection and fluidized bed combustion, desulfurization; catalytic converter and control of vehicular emission, gravity settling chamber, centrifugal collectors, cyclone collectors, fabric filters, and dynamic precipitators electrostatic precipitator.

Unit IV Soil Pollution and Remediation:

Causes of soil pollution, effects of pesticides on soil components, residual effects, and pollution. Synthetic fertilizers and their effects on soil, industrial effluents and their interaction with soil components, remediation technologies.

Unit V Fundamentals of Meteorology:

Atmospheric thermodynamics- equation of state of dry and moist air, specific heats, and application of laws of thermodynamics, thermodynamics processes, temperature lapse rate and inversion; atmospheric stability, scales in meteorology, energy budget near the surface, planetary boundary layer. micrometeorology: effects of topography, applications to vegetated surfaces, urban areas, urban climatology, heat dome, human beings, and animals, impact on the physiology of plants and animals, stress-induced changes.

Unit VI Pollution Meteorology and Climatology:

Application of meteorological principles to transport and diffusion of pollutants; diffusion and turbulence, mixing height; effect of meteorological factors on air pollution, size and structure of plume, wind rose diagram, dispersion of air pollutants - Gaussian model, the reaction of pollutants in air forming smog, PAN, acid rain. Climatology: elements of weather and climate, climatic controls, energy balance in the atmosphere, elementary ideas about weather systems, climatic classifications; climates in India, monsoons of India. Pollution Climatology: preliminary concepts of climate change, seasons in India; monsoons; El Nino and ENSO; enhanced greenhouse effect- global warming; GHGs in the atmosphere; effects of global

warming

REFERENCES

1. John Wallace, Peter Hobbs. 2006. *Atmospheric Science, An Introductory Survey*, Academic Press
2. S. K Garg, 2021. *Environmental Engineering Sewage Waste Disposal and Air Pollution Engineering, Vol.2*, Khanna Publishers.
3. Edward Aguado and James E. Burt. 2015. *Understanding Weather and Climate, Seventh Edition*, Pearson
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8. *Waste Water treatment Plan design. 1997. A manual of practice*, Water Pollution Control Federation
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17. Bin Wang. 2006. *The Asian Monsoon*, Springer, Berlin, Heidelberg, ISBN: 978-3-540-37722-1

22ENV601 Environmental Impact Assessment & Management Systems (3-0-0-3)

Course Outcomes (COs)

The course enables the student to understand whether a particular developmental project would require an EIA.

It will help the student to familiarize themselves with the methods and procedures of EIA.

The course provides the students with a baseline survey on how impacts might be mitigated and monitored.

This will train the student about ways to implement Environmental Management Systems and Environmental Audits.

Course Content

Unit I. Environmental Impact Analysis:

Definition of impact and assessment, origin, types, importance, and characteristics of EIA, EIA methodologies, checklist, matrices and networks, cost-benefit analysis, case studies, Environmental Impact Assessment Notification 2006. Environmental inventory. Baseline data, project data, and project alternative data. Prediction of impact - physical, social, economic, ecological; public participation in environmental decision making. Environmental Impact

Statement (EIS) and Environmental Management Plan (EMP), Strategic Environmental Impact Assessment (SEA)- rationale, scope, process, benefits, and constraints. Definition, Impact identification and methods of impact identification, adhoc method, checklist, matrix, network, and overlay; impact prediction and predictive methodologies, case studies.

Unit II Discussion on Environmental Impact Assessment Reports of a Few Development Projects:

Mining projects, hydro-electric and irrigation projects (River Valley projects), on-shore and off-shore oil exploration, thermal power plants, applications of RS & GIS in EIA.

Unit IV Implementation of Environmental Management Systems:

Introduction to ISO 14001(2015) and risk-based approach, concept of continual improvement and PDCA, environment policy, identification and evaluation of environmental aspects and impacts, legal and other requirements, objectives, targets, and programs, competence of employees, communication, standard operating procedures, emergency preparedness, compliance assessment, management system audit, and management review

Unit V: Environmental Audit:

Definition of audit and audit criterion, basics of environmental audit and its need, types of environmental audits- process audit, management audit, liability audit, compliance audit, client-driven audits, auditing of EMAS, environmental statement (1993), environmental audit procedure and methods (ISO – 19011 (2018), case studies.

REFERENCES

1. *EIA Notification, 2006, Ministry of Environment & Forests, Government of India*
<http://www.environmentwb.gov.in/pdf/EIA%20Notification,%202006.pdf>
2. *Barthwal R.R. 2002. Environmental Impact Assessment, New Age International (P)Ltd. Pub New Delhi.*
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11. *Weston, J. 1997. Planning and EIA in Practice, Longman*

22ENV602 Environmental Economics, Ethics, Laws, and Policy

3-0-0-3

Course Outcomes (COs)

The course is designed to give complete insight into the economics of pollution and climate change and to educate the students on various aspects of environmental auditing.

It also imparts knowledge about environmental laws, regulations, and policies of India and International Environmental laws.

It will help the students to understand the available international and national legal provisions.

It will provide an insight into the National Environmental policy and Regulatory framework.

Course Content

Unit I Environment Economics:

Nature and scope of environmental economics, economics, and ecology, economic problems of resource depletion and pollution, the economics of natural resources exploitation, the economics of pollution, optimum level of pollution; economics of climate change.

Unit II Valuation Techniques:

Types of benefits and costs; methods of valuation of environmental costs and benefits, market value approach of environmental costs and benefits, CBA applied to environmental protection, case study, economic growth, and external cost.

Unit III National Environmental Policy and Regulatory framework:

Environmental policy 2006, environmental policy resolution, public policy strategies in pollution control; International and national conservation agencies. Eco mark, green funding and taxes, trade, and environmental management; Intellectual Property Rights: scheme of labeling of environmentally friendly products (Eco mark), Public Liability Insurance Act 1991.

Unit IV International Environmental Agreements:

Evolution and development of International Environmental Protocols/Conventions with reference to Stockholm conference, Nairobi Declaration, Rio Conference, Rio+5 and Rio+10; global environmental issues and international agreements to control global warming, ozone depletion, acid rains, hazardous wastes; role of UN authorities in the protection of the global environment; CBD, UNFCCC, Kyoto Protocol.

Unit V Environmental Laws in India:

Legal, administrative and constitutional provisions for environmental protection in India; Factories Act of 1948, Motor Vehicle Act, 1988 (amended up to 2019), Indian Forest Act of 1927; the Mines and Minerals Act of 1957; the Environment Protection Act 1986; manufactures, Storage & Import of Hazardous Chemical Rules, 1989, Chemical Accidents Rules, 1996, The National Environment Appellate Authority Act of 1997; The Wildlife Protection Act 1972; The Forest Conservation act of 1980; Biodiversity Act 2002. (Rest of the acts and rules have been addressed in earlier units).

Green bench: constitutional provisions and statutory requirements in India; constitutional protection of the human environment.

Unit VI Environmental Ethics:

Concept of environmental ethics, philosophies of biocentrism and ecocentrism, application of ethics to environmental issues, eastern and western philosophical traditions/religious treaties on the relationships between humans, animals, and the natural environment; ecofeminism; environmental equity and justice.

REFERENCES

1. Gurudeep Singh.2005. *Environmental Law in India –MacMillan, New Delhi*
2. Shyam Dian and Armin Rosencranz. 2001. *Environmental Law and Policy in India, Oxford University Press, New Delhi*
3. ISO 14001, 2015. *Environmental Management Systems- Requirements with Guidance for Use (International Organization for Standardization, Switzerland).*
4. Srivastava, D.C. 2005. *Readings in Environmental Ethics: Multidisciplinary perspectives, Rawat Publications, Jaipur*
5. Divan, Sand Rosencranz, A. 2001. *Environmental Law and Policy in India. Oxford University Press. New Delhi.*
6. Misra R.P. 1995. *Environmental Ethics, Concept Publishing Company, New Delhi*

Course Outcomes (COs)

This course will help the student to understand various aspects of environmental toxicology.

It will guide the student to the world of different toxicant classes from various natural and anthropogenic sources.

The course will provide a broad overview of various toxicants in air, water, soil, and domestic settings.

The course will detail the routes of toxicants to the human body and toxicity testing procedures in detail.

It will provide an overview of occupational and environmental health and toxicant analysis and quality assurance principles.

Course Content

Unit I Introduction to Toxicology:

Definition, scope, history, relationship to other sciences, dose, response relationship, sources of toxic compounds, classes of toxicants, broad overview of toxicant classes such as metals, agricultural chemicals, food additives, contaminants, toxins, solvents, drugs, and cosmetics, history, exposure route, and toxicity of the non-essential metals, cadmium, lead, and mercury, medical treatment of metal poisoning, classes of agricultural chemicals, toxins, source, including microbial, fungal, algal, plant and animal, food additives and contaminants, solvents, therapeutic drugs, drugs of abuse, combustion products, cosmetics.

Unit II Exposure Classes, Toxicants in Air, Water, Soil, Domestic, and Settings:

Occupational air, water, and soil as primary media for human exposure to various classes of chemical toxicants in environmental, domestic, and occupational settings. historic and present status of air pollution and air quality, introduction to the major classes of soil and water pollutants, sources, exposure routes and potential adverse health effects, classes of occupational toxicants, route of exposure and permissible levels, specific examples of concern.

Unit III Toxicants in the Environment:

History of toxicants, principles of toxicology, toxicants and toxicity, types of toxic substances, degradable and non-degradable; sources and entry routes; ecotoxicology, fate, and transport of toxicants in air, water, and food chain, biotransformation and biomagnification, transboundary pollutants, and its effects.

Unit IV Human and Environmental Toxins:

Routes of toxicants to the human body, ADME–Absorption, distribution, metabolism, and excretion; acute and chronic toxicity; lethal and sublethal doses; analysis of NOEL, LD50 and MLD; dose-response relationship and cumulative response; carcinogens, mutagens, and teratogens; toxicity testing procedures.

Unit V Occupational and Environmental Health:

Concepts and scope, global and regional perspectives, basic requirements for a healthy environment, material safety data sheet, environmental quality, human exposure, and health impact; environmental diseases: asbestosis, silicosis, asthma, fluorosis, and allergies; waterborne and vector-borne diseases. Exposure to industrial pollutants, occupational safety

and health, the relationship between occupational hygiene/safety and disease, health problems due to industrial dust, heat, chemicals, noise, toxic gases & metals.

Unit VI Toxicant analysis and Quality Assurance Principles:

Introduction to procedures, principles, and operation of analytical laboratories in toxicology, summary of the general policies, analytical laboratory operation, analytical measurement systems, quality assurance (QA), and quality control (QC) procedures.

REFERENCES

1. Patty's "Industrial Hygiene and Toxicology." 1994. 4th Volume Set, 7th Edition, ISBN: 978-1-119-43802-1
2. N. Irving Sax's "Dangerous Properties of Industrial Materials" 1987. 7th Edition
3. Ernest Hodgson. 2004. *Modern Toxicology*, John Wiley & Sons, Inc.
4. John Wright. 2003. *Environmental Chemistry*, Routledge.
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22ENV604

Surveying

(3-0-0-3)

Course Outcomes (COs)

This course will help the student to understand various methods and principles in surveying.

After studying this course, the student will acquire the necessary skills for undergoing surveying.

It provides details about theodolite surveying, tachometric surveying, and electronic distance measurements.

Course Content

Unit I Introduction to Surveying:

Principles, linear, angular, and graphical methods, survey stations, survey lines- ranging, bearing of survey lines, local attraction, declination, dip, latitude and departure, methods of orientation, principle of resection.

Unit II Levelling & Contouring:

Principles of levelling, automatic levelling staff, booking and reducing levels, height of instrument and rise and fall method, simple, differential, reciprocal levelling, profile leveling,

and cross-sectioning. digital level, components of digital level and advantages of digital level, errors in levelling- benchmarks, temporary and permanent adjustments of automatic level, methods of reduction of levels, arithmetic checks, differential, fly, check and profile levelling, cross-sectioning, curvature and refraction, difficulties in levelling, reciprocal levelling, errors in levelling, contours, characteristics, and uses of contours, locating contours, plotting. area and volume: various methods of computation. latitude and departure, meridian distance method, double meridian distance method, co-ordinate method, trapezoidal and Simpson's method, area by planimeter. volume: trapezoidal and prismoidal rule, volume from contours, capacity of reservoirs. Pentagraph, Planimeter, and Digital planimeter.

Unit III Theodolite Surveying:

Instruments, measurement of horizontal and vertical angle, theodolite, vernier, and micro-optic theodolites, general description of micro-optic theodolite, focusing and sighting, reading, and measuring angles, measuring vertical angles, uses fundamental lines of a theodolite, temporary and permanent adjustments, horizontal angle, reiteration and repetition methods, field book and booking of measurements. Traversing: methods of traversing, plotting, closing error, adjustment of closing error by graphical and analytical methods, Bowditch's rule, conditions of closure, closing error and distribution, tachometric surveying: general principles stadia method, distance and elevation formulae for staff held vertical, instruments constants, analytic lens, tangential method, use of subtense bar.

Unit IV Mass diagram: Construction, Characteristics, and Uses:

Triangulation: triangulation figures, strength of figure, triangulation stations, intervisibility of stations, towers, and signals, satellite stations and reduction to center, theory of errors, types, theory of least squares, the weighting of observations, most probable value, application of weighting, computation of indirectly observed quantities, method of normal equations.

Unit V Electronic Distance Measurement (EDM):

Principle of EDM, classification of EDM instruments, EDM instrument characteristics, errors in electronic distance measurements, different prisms used in electronic distance measurements, accuracy in electronic distance measurements, field procedure for electronic distance measurements, electronic distance measurements without prisms, Distomat. Total station: fundamental parameters of total station, field equipment, accessories, advantages and applications, Introduction to astronomical terms, field procedure for total station survey, errors, and error corrections in total station survey, topographic survey using the total station.

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22ENV605 Geospatial Applications for Environment Management (4-0-0-4)

Course Outcomes (COs)

The course will provide an overall idea about various geospatial applications for the management of the environment.

It will train the students in various methodologies available for digital image processing

This course helps the student to understand the Global Positioning System and its applications in environmental studies.

It will give a thorough understanding of the applications of remote sensing and GIS in ecology and environment management.

Course Content

Unit I Digital Image Processing & GIS:

Digital image formats, file structures, image rectification and restoration, image enhancement, image classification, supervised, unsupervised, ground truth data and training set manipulation, data merging. GIS: introduction, definition, historical evolution, components, basic principles; data models: vector and raster data; spatial and non-spatial data; map projection; defining spatial relationships; spatial analysis: measurements; queries; buffering and neighborhood functions; map overlay; network analysis; spatial interpolation, TIN, DEM, DSM.

Unit II Global Positioning System (GPS):

System segments, GPS satellite signals, GPS error sources, calculating locations, differential GPS, and GPS in differential mode; applications of GPS in environmental studies.

Unit III Advanced Remote Sensing Techniques:

Microwave remote sensing: active and passive systems, advantages, platforms, and sensors, principles of radar: resolution, range, angular measurements, microwaves scattering, imagery, characteristics, and interpretation. hyperspectral remote sensing: sensors, and hyperspectral imaging devices - scanner types and characterization - specifications of various sensors spectrographic imagers, hyperspectral sensors, data formats and systems, AVIRIS, NASA Terra Moderate Resolution Imaging Spectrometer (MODIS), hyperion. LIDAR system design: Introduction to lasers and LIDAR: definitions, LIDAR system components - LIDAR sensors single-return, multi return, waveform, photon-counting, characteristics of LIDAR data, the interaction of laser energy with earth surface features - LIDAR Systems LIDAR remote sensing platforms.

Unit IV Applications in Ecology & Environment Management:

Advanced landscape-level biodiversity characterization, disturbance analysis including forest fire vulnerability analysis and conservation planning, applications in hydrological modeling and analysis: groundwater prospecting, watershed characterization, and conservation treatment planning, applications in community health (epidemiologic) assessment and management; urban ecology: heat island mapping and monitoring, sprawl assessment, and monitoring; land use/land cover dynamics, monitoring, cause-consequence analysis, and modeling, pollution dispersion modeling: water, air and soil, various quality indices soil erosion estimation, zonation and modeling, environmental suitability analysis, eco-sensitive area zonation, multiple criteria decision making, applications in forestry and wildlife management: survey, mapping, and monitoring of land use/land cover, soil, and agriculture; water resources; urban planning; disaster management; health studies

Unit V Participatory/crowdsourced Mapping and Information Sharing:

Web/Internet and mobile Geo-services: crowdsourced mapping, data collection, and information sharing. Web GIS, open geospatial consortium (OGC); FOSS in GIS; data mining; case studies.

REFERENCES

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 18. Chrisman and Nicholas. 1997. *Exploring GIS, John Wiley, and Sons.*
 19. NPTEL Lectures

LABS

22ENV581 LAB I: Ecological Studies and Biodiversity Estimation (0-0-2-1)

Course Outcomes (COs)

This course will help the student to gain hands-on experience in vegetation analysis.

It will equip the student with expertise in hydrobiological characteristics of aquatic ecosystems. It helps the student to estimate the primary productivity of the water body using standard methods.

Course Content

- A. Ground vegetation analysis (Quadrat sampling)
 1. Fixing of the minimum size of quadrates
 2. Fixing the minimum number of quadrates
 3. Determination of frequency
 4. Determination of density and abundance
 5. Determination of dominance
 6. Importance Value Index (IVI)
 7. Diversity measurement: Shannon Wiener, Simpson, and Brillouin's Index.

- B. Aquatic Ecology (Lake and Pond Ecosystems)
 1. Hydrobiological characteristics of a lake ecosystem. (pH, temperature, and dissolved oxygen)
 2. Estimation of primary productivity
 3. Identification of eutrophication characteristics
 4. Assessment of population/community structure, estimation of frequency, density, abundance, IVI, etc. using standard methods
 5. Assessment of biotic interactions like neutralism, commensalism, mutualism, predation, parasitism, proto-cooperation, etc.

22ENV582 LAB -II: Environmental Microbiology (0-0-2-1)

Course Outcomes (COs)

This course is meant to create skills in microbial studies of environmental samples.

To acquire skills in preparation, culturing, and analysis of microbes.

To provide hands-on training on the detection of fecal coliforms and identification of common pathogenic microbes.

Course Content

1. Demonstration of air samplers used in microbial studies
2. Preparation of media for microbial growth
3. Techniques in culturing microbes
4. Microbial examination of potable waters:
 - (a) Detection of fecal pollution (*E. Coli*)
 - (b) Standard Plate Count
 - (c) Most Probable Number (MPN) of coliforms.
5. Gram staining
6. Identification of common pathogenic microbes:
 - (a) *Salmonella* (b) *Vibrio* species (c) *Entamoeba* species (d) *Shigella* species (e) *Mycobacterium* species (f) *Plasmodium* species.
7. Total plate count of soil microorganisms
8. Isolation of *Rhizobium* species from root nodules
9. Microbial growth curves
10. Detection of microorganisms in spoiled foods (bread, rotten meat, fish, fruits etc.)

22ENV583 LAB III: Environmental Pollution Analysis (0-0-3-1)

Course Outcomes (COs)

This lab course is intended to help the student in retrieving information from various available satellite images.

It helps to identify and map different surface features on earth.

Students will gain hands-on experience in working with ground data collection instruments, Radiometers, Spectrometers, etc.

Course Content

1. Study of satellite image annotation (information) LANDSAT, SPOT, and IRS
2. Study of satellite data, identification, and mapping of different surface features
3. Study of ground data collection instruments, radiometers, spectrometers, etc.
4. Study of satellite imagery (black/white) in different bands and visual interpretation
5. Loading image data and display, identification of objects on video display, display of histograms
6. Image enhancement techniques contrast enhancement, band rationing, edge
7. Image registration – image to map, image to image, image to user coordinates
8. Image classification techniques – supervised and unsupervised
9. Site suitability analysis
10. GIS database creation
11. Forest vegetation analysis & mapping using satellite images
12. Forest change detection

Field Visits/Industrial Visit

1. Field study / visits (visiting different ecosystems)
 - a. Rocky and sandy coast
 - b. Hilly terrain
 - c. Marshy swamp
 - d. Backwaters
 - e. Forest ecosystem
 - f. Lake ecosystem
 - g. Riverine ecosystem
 - h. Mangrove ecosystem.
2. Collection and identification of insect fauna
3. Bird watching and identification
4. Field study of a local park/wild habitat
5. Examination of host plants of butterflies
6. Examination of the life cycle of butterflies
7. Nesting habits of bees
8. Field visits to different areas to identify ecological degradation
9. Development of an eco-restoration strategy for denuded hills
10. Development of an eco-restoration strategy for aesthetic enhancement of beaches
11. Visits industrial establishments to know more about pollution devices and pollution management

Expert Lectures (NRSC, ISRO, IIRS, IIST etc.)

ELECTIVES

22ENV631

Green Chemistry

(3-0-0-3)

Course Outcomes (COs)

To introduce students to the basics of green chemistry and sustainability.

To make them understand the concept of sustainability from green to sustainable chemistry.

To make students aware of the green chemistry technologies and alternate energy sources.

Course Content

Unit 1 Green Chemistry and Sustainability:

History of green chemistry, chemical composition of the environment (air, water and soil, role of organic and inorganic molecules in pollution), principles designs and applications, green chemistry as an expression of environmental ethics (Thrift Chemistry), the concept of sustainability, from green to sustainable chemistry, sustainable use of chemical feedstock, water, and energy, quantifying greenness of a chemical reaction, green chemistry metrics, mass-based, energy and environmental metrics, designing greener process, LCA

Unit II Green Toxicology:

Need, principles of toxicology, disposition of toxicants in organisms, non-organ system toxicity, mechanistic toxicology, quantitative structure-activity relationships, (environmental toxicology, persistence, and bioaccumulation), non-cancer risk assessment, stakeholders in sustainable policy implementation.

Unit III Chemistry in Water:

Definition and attributes of a green solvent, the principle, and reasons for use of water in green chemistry, hydrophobicity, green processes with base in water, green oxidations, and reduction in water, on water conditions, use of water in the microwave and ultrasonic technology.

Unit IV Green Solvents:

Ionic liquids as green solvents, definition and notation, properties, synthesis and use in organic reactions, oxidation, oxidative carbonylation of aniline, dimethyl carbonates synthesis in ionic liquids.

Unit V Green Chemistry and Catalysis:

Importance of catalysis, turnover number and, frequency, the basis of catalysis, kinetic phenomenon, basics of homogeneous, heterogeneous, and bio-catalysis, supported catalysts and reagents for green chemistry, heterogenized reactions for green chemistry, preparation of the solid catalyst, slurry and co-precipitation, impregnation, hydrothermal synthesis, drying, calcination, activation, and forming, selecting the right support, catalyst characterization, surface characterization methods, temperature-programmed techniques, spectroscopy, and microscopy.

Unit V Green Chemistry Technologies and Alternate Energy Sources:

Design for energy efficiency, photochemical reactions advantages of and challenges faced by photochemical processes, microwaves as energy source in chemistry, properties of microwaves, microwave heating (effects), renewable sources of energy, solar energy, wind power, geothermal Solution, hydropower, sources, merits and difficulties in widespread applications, Indian energy scenario, Energy Conservation Act (2001), features.

REFERENCES

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2. Jean, Louis Luche. 1998. *Synthetic organic Sonochemistry*, Springer Science Business Media New York.
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22ENV632

Environmental Applications of Nanotechnology

(3-0-0-3)

Course Outcomes (COs)

This course will introduce the students to the world of nanomaterials for environmental applications.

The student will gain knowledge about the societal and environmental impacts of nanotechnology.

It will provide an overview of green manufacturing and industrial technology.

Course Content

Unit 1 Introduction to Nanomaterials:

Historical introduction, bulk vs. nano size, the concept of nano and its evolution. Size-dependence of properties. Electronic structure theory of metals and semiconductors. Quantum size effects. Metal nanoparticles, semiconductor quantum dots, nano porous materials, mesoporous and microporous materials, carbon nanostructures: fullerenes, carbon nanotubes, micelles, bilayers, biological nanostructures. Methods of synthesis of nanoparticles- an overview, green pathways of synthesis, pros, and cons.

Unit II Industrial Applications of Nanotechnology:

Nanotechnology applications in electrical and electronics industry, biomedical and pharmaceutical industry. chemical industry, agriculture and food technology, agriculture, precision farming, smart delivery system, insecticides using nanotechnology, potential of nanofertilizers, nanotechnology in the food industry, packaging, food processing, food safety, and biosecurity, contaminant detection, smart packaging, textiles and cosmetics, nanofiber production, tissue engineering application, nano finishing in textiles (UV resistant, antibacterial, hydrophilic, self-cleaning, flame retardant finishes), modern textiles (lightweight bulletproof vests and shirts, color changing property, waterproof and germ proof, cleaner kid's clothes, wired and ready to wear) cosmetics, formulation of gels, shampoos, hair-conditioners (micellar self-assembly and its manipulation), sunscreen dispersions for UV protection using titanium oxide, color cosmetics.

Unit III Societal Impacts of Nanotechnology:

Socio-economic impact of nanoscale science, managing the nanotechnology revolution: The emerging nano economy: key drivers, challenges, and opportunities, sustaining the impact of nanotechnology on productivity, navigating nanotechnology through society, nanotechnology: societal implications: individual perspectives, nanotechnology, and social trends - five

nanotech social scenarios, technological revolutions and the limits of ethics in an age of commercialization, vision, innovation, and policy.

Unit IV Green Manufacturing Technology:

Waste management, sustainability, and global conditions, material, and solid waste management - energy management, chemical waste management, and green chemistry, climate change and air emissions management, supply water and wastewater management, environmental business management.

Unit V Industrial Applications:

The present state of green manufacturing, plastics from vegetable oils, Cellulose and starch-based materials, natural fillers, fibers, reinforcements, and clay nanocomposites, biodegradability, life cycle assessment, and economics of using natural materials.

REFERENCES

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22ENV633

Environmental Health Perspectives

(3-0-0-3)

Course Outcomes (COs)

To make the students the basic principles and the major environmental health problems.

The student will get an overview of the contamination of food by pesticide residues and artificial additives in food and their health impacts on human beings.

Help the student to understand the health impacts due to climate change.

Course Content

Unit I Environmental Health:

Definition, basic principles, major environmental health problems, air pollution: indoor and outdoor pollution, major air pollutants, toxic chemicals in the air. Indoor air pollution, sources, and health hazards, national ambient air quality standards.

Unit II Pollution from Manmade Sources:

Sources of water pollutants and their health impacts. Standards for drinking water, waterborne diseases, vector-borne diseases, drinking water disinfection methods, carcinogenicity of disinfection by-products. sources of soil pollutants and soil-borne diseases.

Unit III Contamination of Food:

Pesticide residues and heavy metals in food, food additives, preservatives, coloring agents, impacts on human health, foodborne diseases, and causative agents.

Unit IV Health Impacts Due to Exposure to Radiation:

Sources of radiations, manmade radiations and natural radiations, radiation syndromes, radiation effects, occupational pollution, and health hazards: occupational exposure of workers to pollutants and health impacts.

Unit V Health Impacts Due to Climate Change:

Climate and Chronic Respiratory Diseases (CRD), direct impacts of climate, indirect impacts of climate, antioxidants in health and disease, autooxidation and free radicals, natural and synthetic antioxidants, therapeutic benefits of antioxidants. Environmental Health Impact Assessment (EHIA) - definition, significance of EHIA.

REFERENCES

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22ENV634

Ecotourism

(3-0-0-3)

Course Outcomes (COs)

This course will help the student to identify the social and ecological impacts of tourism.

It will introduce the concept of ecotourism, its resources, and practices in general.

The course helps to develop an ecotourism product by developing partnerships, tapping local knowledge, policies, and guidelines, educating and marketing ecotourism service providers.

Course Content

Unit I Introduction:

Definition, social and ecological impacts of tourism, concept of ecotourism, ecotourism and related sub-sectors of the tourism industry, ecotourism criteria, Quebec declaration on ecotourism.

Unit II Ecotourism Resources:

Identifying, listing, and understanding ecotourism resource categories (natural, built, and events) protected areas: definition, categories, and roles, identifying and describing ecotourism products, components of ecotourism, ecotourism and conservation, ecotourism and protected areas, ecotourism and economic benefits, social benefits. local community, need for ecotourism and education.

Unit III Ecotourism Practices:

Transportation, facilities (reduce, replace, reuse, recycle), services (types, activities, and code of ethics), the ecotourists (types, and code of ethics), case studies of ecotourism in practice, best practice guidance, certification, identify existing examples and case studies of eco-friendly practices in the tourism industry.

Unit IV Developing an Ecotourism Product:

Identifying products, developing partnerships, tapping local knowledge, incorporating research, zoning, developing policies and guidelines, educating and marketing, knowledge, skills, attitude, and commitment of ecotourism service providers.

Unit V Ecotourism in the National/Global Context:

Convention on biological diversity, millennium development goals, ecotourism-based/related employment: scope and areas of employment for rural communities.

REFERENCES

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22ENV638

Industrial Safety and Hazard Analysis

(3-0-0-3)

Course Outcomes (COs)

This course will help students develop a good understanding of industrial safety and hazard analysis.

This course will help the student to have an idea about the safety aspects related to the transport, handling, and storage of flammable liquids and gases and toxic materials in an industry.

It will train the students to get an overview of the hazard mitigation systems, emergency planning, fire protection, and fire fighting in an industry.

Course Content

Unit I Introduction:

Factories Act 1948, introduction ISO standard (ISO-45001,2018), with reference to the chemical industry, safety aspects pertaining to the design of chemical plants. Industrial hygiene and safety aspects related to toxicity, fire and explosion, corrosive chemicals, noise, pressure, temperature, vibrations, radiations.

Unit II Hazard Analysis:

Hazard identification, assessment, and safety audit, HAZOP, HAZAN and consequence analysis, safety aspects related to (i) transport handling and storage of flammable liquids and gases and toxic materials (ii) process equipment including piping (fire, static electricity, pressure, temperature, etc.).

Unit III Safety Measures:

Safety aspects at process development and design stage. Reliability engineering, hazard mitigation systems emergency planning, case studies, fire hazards: classification of fires, fire protection, and firefighting.

Unit IV Risk Management:

Spillage, leakage, and operational failure, case study of accidents, risk analysis, personal protective equipment, raw material acquisition stage, manufacturing stage, use/reuse/maintenance stage, recycle/waste management stage.

REFERENCES

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22ENV637

Renewable Energy Resources

(3-0-0-3)

Course Outcomes (COs)

This course will provide the student with an overview of the available renewable energy options.

It will help the students to understand the energy flow in major manmade ecosystems, agricultural, industrial, and urban ecosystems.

It will train students about solar, wind, and bioenergy based renewable energy options.

Course Content

Unit I Introduction:

Introduction to the link between energy, environment, and sustainable development; energy sources, sun as the source of energy; photosynthesis; classification of energy sources, fossil fuel reserves, and resources, an overview of global/ India's energy scenario.

Unit II Solar Energy:

Solar radiation: measurements and prediction. India's solar energy potential and challenges, Solar thermal energy conversions systems: flat plate collectors, solar concentrators, and other applications. solar photovoltaic: principle of photovoltaic conversion of solar energy, types of solar cells, and fabrication

Unit III Wind Energy:

Wind resource: meteorology of wind, India's wind energy potential and challenges, distribution across the world, eolian features, biological indicators. wind measurement systems: anemometers, wind velocity distributions, wind shear, turbulence, Betz limit, and energy potentials. wind energy conversion systems: classifications and applications

Unit IV Bioenergy:

Biomass as energy resources; bioenergy and challenges- classification and estimation of biomass; source and characteristics of biofuels: characteristics of biofuels: biodiesel, bioethanol, biobutanol, biogas. types of biomass energy conversion systems waste to energy conversions.

Unit V: Other Renewable Technologies:

Hydel, geothermal, wave, tidal, OTEC, hydrogen,

REFERENCES

1. D. Y. Goswami, F. Kreith and J. F. Kreider.2000. *Principles of Solar Engineering*, Taylor & Francis
2. C. S. Solanki .2015. *Solar Photovoltaics: Fundamental Applications and Technologies*, Prentice Hall

22ENV636

Green Product Design

(3-0-0-3)

Course Outcomes (COs)

It provides the student with green product design, life cycle assessment of the product, and environment load about the product.

Helps the students to integrate the existing product design with more quality, productability, and upgradability.

It will help the student to understand the concept of ecolabelling and its benefits.

Course Content

Unit I Green product design:

Definition, product strategy, life cycle of the product, ISO 14040, 2006, environmental load of product, material selection, resource use, production requirements, and planning for the final disposition (recycling, reuse, or disposal) of a product

Unit II Integration with the existing product design:

Approaches such as quality, producibility, functionality, and upgradeability.

Unit III Greening Process:

Greening supplier inputs, improving whole Systems, international laws on take-back laws, extended producer responsibility.

Unit IV Eco-labelling:

Examples of ecolabelling: from foods, cosmetics, packaging, computers, polymers, automobiles, electronics industry.

REFERENCES

1. *Fiksel, Joseph.1995. Design for Environment: creating eco-efficient products and processes. New York: McGraw-Hill*
2. *Billatos, Samir B. and Nadia A. Basaly.1995. Green Technology and Design for the Environment*

22ENV635 Sustainable Management Systems**(3-0-0-3)****Course Outcomes (COs)**

To make students appreciate the state of the environment, unsustainability, and emphasis the need for sustainable development.

To make the students understand the linear and cyclic management systems.

To know about social issues related to the environment and address it in a global and national state of housing and shelter, urbanization, etc.

Course Content**Unit I Introduction:**

State of environment and unsustainability, need for sustainable development, traditional conservation systems in India, people in environment, need for an attitudinal change and ethics,

Unit II Linear vs. Cyclical Resource Management Systems:

Need for systems thinking and design of cyclical systems, circular economy, industrial ecology, green technology. Specifically apply these concepts to water resources, energy resources, food resources, land & forests, waste management. Discuss the interrelation of environmental issues with social issues such as population, illiteracy, poverty, gender equality, class discrimination, social impacts of development on the poor and tribal communities, conservation movements: people's movements and activism, indigenous knowledge systems and traditions of conservation.

Unit III Common goods and Public Goods:

Natural capital/tragedy of commons, cost-benefit analysis of development projects, Environment Impact Assessment (EIA), Environment Management Plan (EMP), green business, eco-labelling, problems, and solutions with case studies.

Unit IV Social Issues:

Global and national state of housing and shelter, urbanization, effects of unplanned development case studies, impacts of the building and road construction industry on the environment, sustainable communities, and sustainable cities.

Unit V Ethical Issues:

Related to resource consumption, intergenerational ethics, the need for investigation and resolution of the root cause of unsustainability, traditional value systems of India, and significance of holistic value-based education for true sustainability.

REFERENCES

1. Dixon Tim, Enmes M, Hunt M & Lannoa S.2014. "Urban Retrofitting for Sustainability: Mapping the Transition to 2050, Part II Chapter 7: Urban design & the retrofit agenda", Earthscan from Routledge, London, NY.
2. Daniel D. Chiras.2012. *Environmental Science*. Jones & Bartlett Publishers, 01-Feb-, 669 pages. ISBN: 9781449645311.
3. [URL:http://pubs.iied.org/pdfs/G03177.pdf](http://pubs.iied.org/pdfs/G03177.pdf)
4. Annenberg Learner. 2015. *The Habitable Planet*, Annenberg Foundation, URL: <http://www.learner.org/courses/envsci/unit/pdfs/textbook.pdf>.

22ENV639

Advanced Statistical Methods

(3-0-0-3)

Course Outcomes (COs)

To familiarize students with the application of statistical tools to enable them to easily perform complicated quantitative analyses.

To make the students understand the different ways to present their results following statistical methods.

Course Content

Unit 1 Introduction:

Relevance of statistical analysis in research, the scope of analysis in research, types of research, and types of analysis in different areas.

Unit II Overview of Methods in Statistics:

Sampling methods-, classification and tabulation of data, sampling design, data processing, and analysis strategies

Unit III Numerical and Graphical Data Analysis:

Data analysis with Statistical Packages (SPSS, overview of available software) hypothesis testing, generalization and interpretation, ANOVA, T-Test, Multivariate Analysis Techniques, mathematical modelling an overview. Tools for statistical analysis, familiarizing the tool window, common buttons, available menu, entering and editing data.

REFERENCES

1. Zar, Jerrold, H. 1998. *Biostatistical Analysis*, Prentice-Hall, NJ
2. Wayne R Ott. 1995. *Environmental Statistics and Data Analysis*, CRC Press
3. Manly.2001. *Statistics for Environmental Science and Management*, Chapman and Hall, CRC
4. Date, C.J. 1986. *An introduction to Database System*, Addison Wesley, UK
5. Medhi, J. 1992. *Statistical Methods*, Wiley Eastern, New Delhi

6. *Barnett, Vic. 2006. Environmental Statistics: Methods and Applications, John Wiley and Sons, New Delhi*
7. *C, R Kothari, Research methodology – Methods and techniques, New Age International Publishers*

21SSK501

LIFE SKILLS

P/F

Course objective

Bridge the gap between a student and a student becoming an employee or an entrepreneur. Aims to provide students with the knowledge and skills to understand and participate in the modern business scenario and the world of economics so as to prepare them to achieve success in their career.

Course outcomes

Soft Skills:

CO1 At the end of the course, the students would have developed self-confidence and positive attitude necessary to compete and challenge themselves. They would also be able to analyse and manage their emotions to face real life situations.

CO2 At the end of the course, the students shall learn to examine the context of a Group Discussion topic and develop new perspectives and ideas through brainstorming and arrive at a consensus.

CO3 At the end of the course, the students will have the ability to prepare a suitable resume. They would also have acquired the necessary skills, abilities and knowledge to present themselves confidently. They would be sure-footed in introducing themselves and facing interviews.

CO4 At the end of the course the students will have the ability to analyse every question asked by the interviewer, compose correct responses and respond in the right manner to justify and convince the interviewer of one's right candidature through displaying etiquette, positive attitude and courteous communication.

Aptitude:

CO5 At the end of the course, the student will have acquired the ability to analyse, understand and classify questions under arithmetic, algebra and logical reasoning and solve them employing the most suitable methods. They will be able to analyse, compare and arrive at conclusions for data analysis questions.

CO6 At the end of the course, students will be able to interpret, critically analyse and solve logical reasoning questions. They will have acquired the skills to manage time while applying methods to solve questions on arithmetic, algebra, logical reasoning, statistics and data analysis and arrive at appropriate conclusions.

Verbal:

CO7 At the end of the course, the students will have the ability to understand the nuances of English grammar and apply them effectively.

CO8 At the end of the course, the students will have the ability to relate, choose, conclude and determine the usage of right vocabulary.

CO9 At the end of the course, the students will have the ability to decide, conclude, identify and choose the right grammatical construction.

Soft skills and its importance: Pleasure and pains of transition from an academic environment to work-environment. Need for change. Fears, stress and competition in the professional world. Importance of positive attitude, selfmotivation and continuous knowledge upgradation.

Attitude, Values, Motivation, Emotion Management, Steps to like yourself, Positive Mental Attitude, Assertiveness.

Resume writing Group discussion. Concepts. Mock GDs. Interviews.

Presentation skills – Guidelines.

Vocabulary: Synonyms; Antonyms; Analogy; one-word substitutes; idioms; phrasal verbs;

Grammar: Article and preposition; SV agreement; tenses; voices; modifiers; parallelism.

Reading and comprehension; parajumble.

Problem Solving: Problems on numbers; Percentages; Ratio, proportions and variations; Time and distance; Time, men and work.

Data interpretation: Numerical Data Tables; Line Graphs; Bar Charts and Pie Charts; Caselet

Forms; Mix Diagrams; Geometrical Diagrams and other forms of Data Representation.

Logical Reasoning: Family Tree; Linear Arrangements; Circular and Complex Arrangement; Conditionalities and Grouping; Sequencing and Scheduling; Selections; Networks; Codes;

Cubes; Venn Diagram in Logical Reasoning.

TEXTBOOKS:

1. A Communicative Grammar of English: Geoffrey Leech and Jan Svartvik. Longman, London.
2. Adair. J., (1986), "Effective Team Building: How to make a winning team", London, U.K: Pan Books.
3. Gulati. S., (2006) "Corporate Soft Skills", New Delhi, India: Rupa & Co.
4. The Hard Truth about Soft Skills, by Amazone Publication.

REFERENCES:

1. Quantitative Aptitude, by R S Aggarwal, S Chand Publ.
2. Verbal and Non-verbal Reasoning, R S Aggarwal, S Chand Publ.
3. Data Interpretation, R S Aggarwal, S Chand Publ.
4. Nova GRE, KAPAL GRE, Barrons GRE books.
5. Quantitative Aptitude, The Institute of Chartered Accountants of India.
6. More Games Teams Play, by Leslie Bendaly, McGraw-Hill Ryerson.
7. The BBC and British Council online resources
8. Owl Purdue University online teaching resources.
9. www.the grammarbook.com online teaching resources
10. www.englishpage.com online teaching resources and other useful websites.

21AVP501

Amrita Values Program

1 0 0 1

Amrita University's Amrita Values Program (AVP) is a new initiative to give exposure to students to the richness and beauty of the Indian way of life. India is a country where history, culture, art, aesthetics, cuisine, and nature exhibit more diversity than anywhere else in the world. Amrita Values Programs emphasize making students familiar with the rich tapestry of Indian life, culture, arts, science, and heritage which has historically drawn people from all over the world. Post-graduate students shall have to register for any one of the following courses, in the second semester, which may be offered by the respective school.

Courses offered under the framework of the Amrita Values Program:

Art of Living through Amma

Amma's messages can be put into action in our life through pragmatism and attuning of our thought process in a positive and creative manner. Every single word Amma speaks, and the

guidance received in matters which we consider trivial are rich in content and touches the very inner being of our personality. Life gets enriched by Amma's guidance, and She teaches us the art of exemplary life skills where we become witness to all the happenings around us keeping the balance of the mind.

Insights from the Ramayana

The historical significance of Ramayana, the first Epic in the world, influence of Ramayana on Indian values and culture, storyline of Ramayana, study of leading characters in Ramayana, influence of Ramayana outside India, misinterpretation of Ramayana by colonial powers and its impact on Indian life, relevance of Ramayana for modern times.

Insights from the Mahabharata

The historical significance of Mahabharata, the largest Epic in the world, influence of Mahabharata on Indian values and culture, storyline of Mahabharata, study of leading characters in Mahabharata, Kurukshetra War and its significance, importance of Dharma in society, message of the Bhagavad Gita, relevance of Mahabharata for modern times.

Insights from the Upanishads

Introduction: Sruti versus Smrti, overview of the four Vedas and the ten Principal Upanishads, the central problems of the Upanishads, ultimate reality, the nature of Atman, the different modes of consciousness, Sanatana Dharma and its uniqueness, The Upanishads and Indian Culture, relevance of Upanishads for modern times, a few Upanishad Personalities: Nachiketas, Satyakama Jabala, Aruni, Shvetaketu.

Insights from Bhagavad Gita

Introduction to Bhagavad Gita, brief storyline of Mahabharata, context of Kurukshetra War, the anguish of Arjuna, counsel by Sri. Krishna, key teachings of the Bhagavad Gita, Karma Yoga, Jnana Yoga, and Bhakti Yoga, theory of Karma and Reincarnation, concept of Dharma, idea of the self and realization of the self, qualities of a realized person, concept of Avatar, relevance of Mahabharata for modern times.

Swami Vivekananda and his Message

Brief sketch of Swami Vivekananda's life, meeting with Guru, disciplining of Narendra, travel across India, inspiring life incidents, address at the parliament of religions, travel in the United States and Europe, return and reception India, message to Indians about our duties to the nation.

Great Spiritual Teachers of India

Sri Rama, Sri Krishna, Sri Buddha, Adi Shankaracharya, Sri Ramanujacharya, Sri Madhvacharya, Sri Ramakrishna Paramahansa, Swami Vivekananda, Sri Ramana Maharshi, Mata Amritanandamayi Devi

Indian Arts and Literature:

The aim of this course is to present the rich literature, culture of ancient India, and help students appreciate their deep influence on Indian life, Vedic culture, the primary source of Indian culture, brief introduction, and appreciation of a few of the art forms of India, arts, music, dance, theatre, paintings, sculpture and architecture, the wonder language, Sanskrit, and ancient Indian Literature.

Importance of Yoga and Meditation in Life:

The objective of the course is to provide practical training in YOGA ASANAS with a sound theoretical base and theory classes on selected verses of Patanjali's Yoga Sutra and Ashtanga Yoga. The coverage also includes the effect of yoga on integrated personality development.

Appreciation of Kerala's Mural Art Forms:

A mural is any piece of artwork painted or applied directly on a wall, ceiling, or another large permanent surface. In the contemporary scenario, Mural painting is not restricted to permanent structures and is being done even on canvas. A distinguishing characteristic of mural painting is that the architectural elements of the given space are harmoniously incorporated into the picture. Kerala mural paintings are frescos depicting mythology and legends, which are drawn on the walls of temples and churches in South India, principally in Kerala. Ancient temples, churches, and places in Kerala, South India, display an abounding tradition of mural paintings mostly dating back to the 9th to 12th centuries CE when this form of art enjoyed Royal patronage. Learning Mural painting through the theory and practice workshop is the objective of this course.

Practicing Organic Farming

Life and nature are linked through the healthy practices of society for maintaining sustainability. When modern technological knowledge microorganisms are applied in farming using the traditional practice, we can avoid damage to the environment. The course will train the youth on modern practices of organic farming. Amma says "we have to return this land to the coming generations without allowing even the slightest damage to happen to it." Putting this philosophy to practice will bring about an awakening and enthusiasm in all to strive for good health and to restore the harmony in nature"

Ancient Indian Science and Technology

Science and technology in ancient and medieval India covered all the major branches of human knowledge and activities, including mathematics, astronomy, physics, chemistry, medical science and surgery, fine arts, mechanical, civil engineering, architecture, shipbuilding, and navigation. Ancient India was a land of sages, saints, and seers as well as a land of scholars and scientists. The course gives awareness of India's contribution to science and technology.

21CUL501

Cultural Education

2 0 0 P/F

Objective: Love is the substratum of life and spirituality. If love is absent life becomes meaningless. In the present world, if love is used as the string to connect the beads of values,

life becomes precious, rare, and beautiful like a fragrant blossom. Values are not to be learned alone. They must be imbibed into the inner spirit and put into practice. This should happen at the right time when you have vitality and strength when your hearts are open.

The present course in value education is a humble experience-based effort to lead and metamorphosis the students through the process of transformation of their inner self towards achieving the best. Amma's nectarous words of wisdom and acts of love are our guiding principles. Amma's philosophy provides an insight into the vision of our optimistic future.

1. Invocation, Satsang, and Question-Answers
2. Values - What are they? Definition, Guiding Principles with examples Sharing own experiences
3. Values - Key to a meaningful life. Values in different contexts
4. Personality - Mind, Soul, and Consciousness - Q and A. Body-Mind-Intellect and the Innerpsyche Experience sharing
5. Psychological Significance of samskara (with e.g. From Epics)
6. Indian Heritage and Contribution and Q and A; Indian Ethos and Culture
7. Self-Discipline (Evolution and Practice) – Q and A
8. Human Development and Spiritual Growth - Q and A
9. Purpose of Life plus Q and A
10. Cultivating self-Development, Self-effort, and Divine Grace - their roles – Q and A.
11. Vedanta and Creation - Understanding a spiritual Master
12. Dimensions of Spiritual Education; Need for change Lecture – 1; Need for Perfection Lecture – 2
13. How to help others who have achieved less - Man and Nature Q and A, Sharing of experiences

REFERENCES

1. *Swami Amritaswaroopananda Puri - Awaken Children (Volume VII and VIII)*
2. *Swami Amritaswaroopananda Puri - Amma's Heart*
3. *Swami Ramakrishnanda Puri - Rising Along the Razor's Edge*
4. *Deepak Chopra - Book 1: Quantum Healing; Book 2: Alpha and Omega of God; Book 3: Seven Spiritual Rules for Success*
5. *Dr. A. P. J. Abdul Kalam - 1. Ignited Minds 2. Talks (CD)*
6. *Swami Ramakrishnanda Puri - Ultimate Success*
7. *Swami Jnanamritananda Puri - Upadesamritham (Trans: Malayalam)*
8. *Vedanta Kesari Publication - Values - Key to a meaningful life*
9. *Swami Ranganathananda - Eternal values for a changing society*
10. *David Megginson and Vivien Whitaker - Cultivating Self Development*
11. *Elizabeth B. Hurlock - Personality Development, Tata McGraw Hill*
12. *Swami Jagatatmananda - Learn to Live (Vol.1 and 2), RK Ashram, Mylapore*

22AVP103

Mastery Over Mind (MAOM)

1-0-2 2

1. Course Overview

Master Over the Mind (MAOM) is an Amrita initiative to implement schemes and organise university-wide programs to enhance health and wellbeing of all faculty, staff, and students (UN SDG -3). This program as part of our efforts for sustainable stress reduction gives an introduction

to immediate and long-term benefits and equips every attendee to manage stressful emotions and anxiety facilitating inner peace and harmony.

With a meditation technique offered by Amrita Chancellor and world-renowned humanitarian and spiritual leader, Sri Mata Amritanandamayi Devi (Amma), this course has been planned to be offered to all students of all campuses of AMRITA, starting off with all first years, wherein one hour per week is completely dedicated for guided practical meditation session and one hour on the theory aspects of MAOM. The theory section comprises lecture hours within a structured syllabus and will include invited guest lecture series from eminent personalities from diverse fields of excellence. This course will enhance the understanding of experiential learning based on university's mission: "Education for Life along with Education for Living", and is aimed to allow learners to realize and rediscover the infinite potential of one's true Being and the fulfilment of life's goals.

2. Course Syllabus

Unit 1 (4 hours)

Causes of Stress: The problem of not being relaxed. Need for meditation -basics of stress management at home and workplace. Traditions and Culture. Principles of meditation– promote a sense of control and autonomy in the Universal Human Value System. Different stages of Meditation. Various Meditation Models. Various practices of Meditation techniques in different schools of philosophy and Indian Knowledge System.

Unit 2 (4 hours)

Improving work and study performance. Meditation in daily life. Cultivating compassion and good mental health with an attitude of openness and acceptance. Research and Science of Meditation: Significance of practising meditation and perspectives from diverse fields like science, medicine, technology, philosophy, culture, arts, management, sports, economics, healthcare, environment etc. The role of meditation for stress and anxiety reduction in one's life with insights based on recent cutting-edge technology. The effect of practicing meditation for the wholesome wellbeing of an individual.

Unit 3 (4 hours)

Communications: principles of conscious communication. Relationships and empathy: meditative approach in managing and maintaining better relationships in life during the interactions in the world, role of MAOM in developing compassion, empathy and responsibility, instilling interest, and orientation to humanitarian projects as a key to harness intelligence and compassion in youth. Methodologies to evaluate effective awareness and relaxation gained from meditation. Evaluating the global transformation through meditation by instilling human values which leads to service learning and compassion driven research.

TEXT BOOKS:

- 1.Mata Amritanandamayi Devi, "Cultivating Strength and vitality," published by Mata Amritanandamayi Math, Dec 2019
- 2.Swami Amritaswarupananda Puri , "The Color of Rainbow " published by MAM, Amritapuri.

REFERENCES:

- 1.Craig Groeschel, "Winning the War in Your Mind: Change Your Thinking, Change Your Life" Zondervan Publishers, February 2019

- 2.R Nagarathna et al, “New Perspectives in Stress Management “Swami Vivekananda Yoga Prakashana publications, Jan 1986
3. Swami Amritaswarupananda Puri “Awaken Children Vol 1, 5 and 7 - Dialogues with Amma on Meditation”, August 2019
4. Swami Amritaswarupananda Puri “From Amma’s Heart - Amma’s answer to questions raised during world tours” March 2018
5. Secret of Inner Peace- Swami Ramakrishnananda Puri, Amrita Books, Jan 2018.
6. Mata Amritanandamayi Devi “Compassion :The only way to Peace:Paris Speech”, MA Center, April 2016.
7. Mata Amritanandamayi Devi “Understanding and collaboration between Religions”, MA Center, April 2016.
8. Mata Amritanandamayi Devi “Awakening of Universal Motherhood: Geneva Speech” M A center, April 2016.

3. Evaluation and Grading

Internal			External	Total
<i>Components</i>	<i>Weightage</i>		Practical (attendance and class participation) 60%	100%
Quizzes(based on the reading material)	20%	40%		
Assignments (Based on webinars and lecture series)	20%			

4. Course Outcomes (CO)

CO1: Relate to the causes of stress in one’s life.

CO2: Experiment with a range of relaxation techniques CO3:

Model a meditative approach to work, study, and life.

CO4: Develop appropriate practice of MA-OM technique that is effective in one’s life CO5:

Inculcate a higher level of awareness and focus.

CO6: Evaluate the impact of a meditation technique

***Programme Outcomes(PO)(As given by NBA and ABET)**

PO1: Engineering Knowledge

PO2: Problem Analysis

PO3: Design/Development of Solutions

PO4: Conduct Investigations of complex problems

PO5: Modern tools usage

PO6: Engineer and Society

PO7: Environment and Sustainability

PO8: Ethics

PO9: Individual & Team work

PO10: Communication

PO11: Project management & Finance

PO12: Lifelong learning

CO – PO Affinity Map

PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO															
CO 1	3	3	3	2		-	2	3	-	3	-	3	-	-	-
CO 2	3	3	3	2	2	-	2	3	3	3	-	3	-	-	-
CO 3	3	3	2	2	2	2	2	3	3	3	-	3	-	-	-
CO 4	3	3	3	2	-	2	3	3	3	3	-	3	-	-	-
CO 5	3	2	2	2	-	2	-	3	2	2	-	2	-	-	-
CO 6	3	2	2	2	3	2	-	3	2	2	-	2	-	-	-

OPEN ELECTIVES

21OEL631

ADVANCED STATISTICAL ANALYSIS FOR RESEARCH

2002

Objective: To familiarize students in application of statistical tool to enable them to easily perform complicated quantitative analysis.

Unit 1

Relevance of statistical analysis in research – scope of analysis in research - types of research – types of analysis in different areas.

Unit 2

Test of hypothesis - hypothesis testing procedure – significance level – steps for testing.

Unit 3

Chi-Square – t Test.

Unit 4

Tools for statistical analysis – familiarising the tool window – common buttons – available menu – entering and editing data.

Unit 5

Different types of analysis using tool.

REFERENCE BOOK:

C, R Kothari, *Research methodology – Methods and techniques*, New Age International Publishers

21OEL632

BASICS OF PC SOFTWARE

2 0 0 2

Objective: The main objective of this course is to familiarize the basic concepts of Microsoft Office 2007 applications which promote students to build their knowledge in business applications.

Unit 1

Word Processing Basic - An Introduction to Word Processing, Opening Word Processing package, menu bar, Using the help, Using the Icons below menu bar. Opening, saving and closing documents. Page setup, Page background, Printing of documents, Display/Hiding of Paragraph Marks and inter word Space. Moving around in a document - Scrolling the Document, Scrolling by line/paragraph, Fast scrolling and Moving Pages Text creation and manipulation - Paragraph and Tab setting, Text selection, cut, copy and paste, font and size selection, bold, italic and underline, Alignment of text: center, left, right and justify. Formatting the Text - Changing font, size and color, Paragraph indenting, bullets and numbering, Use of tab and Tab setting, changing case. Inserting - header and footer, page number, date & time, symbols, comments, auto texts, footnotes, citations, caption, index, pictures, files & objects, bookmark, hyperlink.

Unit 2

Handling multiple documents, Opening and closing of multiple documents, cut, copy and paste across the documents. Table Manipulation - Concept of table, rows columns and cells, draw table, changing cell width and height, alignment of text in cell, copying of cell, delete/insertion of row and columns, borders for table. Printing - printing, print preview, print a selected page. Language Utilities - spelling & grammar- Mail merge options, password locking, View - Macros, document views

Unit 3

Elements of Electronics Spread Sheet, Application/usage of Electronic Spread Sheet, Opening of spreadsheet, and menu bar, Creation of cells and addressing of cells, cell inputting. Insert - tables, charts. Illustrations, links, texts. Page Layout - Themes, set up, scale, sheet, arrange. Practicing auto formatting and conditional formatting - Spelling and auto correct - Arranging windows - Freeze panes - Hiding windows. Providing Formulas - Using basic functions/ formalism a cell, Sum function, Average, Percentage, Other basic functions Data - connections, sort & filter, data tools, outline

Unit 4

Inserting slides - new slides, existing slides, duplicate slides, slides from Auto layout. Slide views - normal, slider sorter. Slide layouts, design templates. Deleting slides. Slide show - start with first slide, current slide, customize show. Inserting header & footer, Date and Time, Hyperlink, Format - Font, Bullet & Numbering. Custom animation, slide Transition.

Unit 5

Internet: Introduction to networks and internet, history, working of Internet, Modes of connecting to internet, ISPs, Internet address, standard address, domain name, Modems.

World Wide Web-Introduction, Miscellaneous Web Browsers details, searching the w w w - Directories search engines and meta search engines, search fundamentals, search engines, working of the search engines, Telnet and FTP.

TEXTBOOK:

Alexis Leon & Mathews Leon: *Fundamentals of Information Technology*, Vikas Publishing **REFERENCE BOOKS:**

1. *Microsoft Office 2000 Complete*, BPB publications
2. *Dennis P.Curtin, Kim Foley, Kunal Sen, Cathleen Morin: Information Technology - The Breaking Wave*, TATA McGraw-Hill Edition

21OEL633

COMPUTER HARDWARE AND NETWORKING 1 0 1 2

Objectives: The course aims to give a general understanding of how a computer works. Students will be able to understand the basics of hardware and Networking technologies.

Unit 1

Hardware Basics - Basic Terms, Concepts, and Functions of System Modules, Front and rear panel view of system - Motherboards: Components and Architecture. Popular CPU Chips and their Characteristics, Processor Architecture - Processor specifications - installing and uninstalling processor - CPU Overheating issues - common problems and solutions

Unit 2

Memory and Storage: Memory features – Types of memory – working - Installing and uninstalling memory modules –maintenance and troubleshooting – common problems and solutions. Storage devices – Hard disk details – Working and parts of hard disks – Installing hard disks – maintenance and troubleshooting.

Unit 3

Power supply – SMPS – features – types – installing SMPS – Specification for SMPS. Maintenance and Troubleshooting: Preventive Maintenance and Safety Procedures - Managing Replaceable Components.

Unit 4

Introducing Computer Networks: Overview - Types - Topology - Networks Defined by Resource Location - Client-Server Networks - Peer-to-Peer Networks - Dissecting the OSI Model - The TCP/IP Stack Layers of the TCP/IP Stack - Common Application Protocols in the TCP/IP Stack.

Unit 5

Networking Devices – Repeater, Hub, Switch, Router – Basics of Types of cabling – Crimping - Setting up a LAN.

TEXT BOOKS / REFERENCE BOOKS

1. James K L, "Computer Hardware: Installation, Interfacing Troubleshooting and maintenance", PHI Learning Press (Eastern Economy Edition, 2013)
2. Mark Dye, Rick McDonald, Antoon Ruffi, "Network Fundamentals: CCNA Exploration Companion Guide", Cisco Networking Academy, 2008
3. Kaveh Pahlavan, Prashant Krishnamurthy, "Networking Fundamentals: Wide, Local and Personal Area Communications ", Paperback, 2014

21OEL634

CONSUMER PROTECTION ACT

2 0 0 2

Objective: To know about consumer rights and to understand the grievances redressal forums established under the Consumer Protection Act, 1986.

Unit 1

Consumerism in India (Historical Background), Consumers: the concept, definition and scope. Object of Consumer Protection Act, 1986.

Unit 2

Unfair Trade Practice, Restriction Trade Practice, Defect in goods, Deficiency in service: Medical, Lawyering, Electricity, Housing, Postal services etc.

Unit 3 Consumer rights and its protection; consumer protection councils, powers and functions.

Unit 4 Judicial Enforcement of Consumer Rights: Consumer Forum under C.P.Act - Jurisdiction, Powers and functions, Exceptions of order, Judicial Review, PIL, Class action, Remedies, Appeal, Administrative Remedies, C.P.Courts.

Unit 5 Appeals and orders: enforcement of orders of the consumer forum, Appeals against orders, Administrative control; Dismissal of frivolous and vexatious complaints, Penalties.

REFERENCE TEXTS:

1. Saraf D.N., Law of Consumer Protection in India, 1995
2. R.K.Bangia, Consumer Protection Act
3. P.K.Majumdar, The Law of Consumer Protection in India, 1998 Orient Publishing Co. Delhi

21OEL635

CORPORATE COMMUNICATION

2 0 0 2

Unit 1

Structure and characteristics of an organization; Factors influencing communication

- Flow of communication in an organization - Bottom step, top down vertical and horizontal barriers to communication; Organization of a PR department and counselling firms.

Unit 2

Role of PR in an organization; PR processes - image building - PR and various publics - internal & external; PR and crisis management- national community, labour unrest, and accidents.

Unit 3

PR tools - House journals - kinds and production of house journals; Open house; New media; Gossip, rumour mongering and criticism.

Unit 4

Media Relations - press conference, press releases, press visit, interviews, preparations and distributions of publicity materials to media.

Unit 5

PR for Govt. PR for Non Govt. organizations, PR for armed forces, PR for entertainment and sports, PR for tourism, PR for philanthropic organizations, PR for celebrities. Event management, Ethics in PR.

BOOKS RECOMMENDED:

Balan K.R.: Lectures on applied Public Relations.

Dennis L. Wilcox, Philip H. Ault & Warren K. Agee: Public Relations strategies & tactics.

Mehta D.S.: Handbook of Public Relations in India

Scott M.Cutlip, Allen H. Centre & Glen M. Broom: Effective Public Relations.

Philip Lesley: Lesley's Public Relations Handbook

Kaul J.M.: Public Relations Handbook.

Frank Jefkins: Planned Public Relations

Sam Black: The role of Public Relations in Management.

21OEL636

DESIGN STUDIES

2 0 0 2

Objective: To introduce the students to the field of visual design.

Unit 1

Drawing and illustration.

Unit 2

Design basics.

Unit 3

Principles of composition.

Unit 4

Introduction to type design.

Unit 5

Usage of images, colour in terms of visual design.

REFERENCES:

1. *Thinking with Type* by Ellen Lupton
2. *How to be a Graphic Designer Without Losing Your Soul* by Adrian Shaughnessy

21OEL637

DISASTER MANAGEMENT

2 0 0 2

Objectives: To appreciate the fundamentals of disaster management and to introduce the fundamentals procedure and working during the contingency.

Unit 1 Introduction & Dimensions of Natural & Anthropogenic Disasters, Principles/ Components of Disaster Management, Organizational Structure for Disaster Management,

Unit 2 Disaster Management Schemes/ standard operating procedures, Natural Disasters and Mitigation Efforts, Flood Control, Drought Management, Cyclones, Avalanches, Mangroves, Land Use Planning, Inter-Linking of Rivers, Role of Union/ States, Role of Armed Forces/ Other Agencies In Disasters, Important Statutes/ Legal Provisions, Improvised Explosive Device/ Bomb Threat Planning, Nuclear, biological and chemical threat And Safety Measures, Forest Fires, Oil Fires, Crisis In Power Sector, Accidents In Coal Mines, Terrorism And Emergency Management.

Operations Management (OM), Risk Assessment and Disaster Response, Quantification Techniques, NGO Management, SWOT Analysis based on Design & Formulation Strategies,

Unit 3 Insurance & Risk Management, Role of Financial Institutions in Mitigation Effort, Group Dynamics, Concept of Team Building, Motivation Theories and Applications, School Awareness and Safety Programmes, Psychological and Social Dimensions in Disasters, Trauma and Stress, Emotional Intelligence, Electronic Warning Systems, Recent Trends in Disaster Information Provider, Geo Informatics in Disaster Studies, Cyber Terrorism, Remote Sensing & GIS Technology, Laser Scanning Applications in Disaster Management, Statistical Seismology, Quick Reconstruction Technologies,

Unit 4 Role of Media in Disasters, Management of Epidemics, Bio-Terrorism, Forecasting/ Management of Casualties.

Unit 5 Case Studies - Natural Disaster and Man-made Disasters.

REFERENCES:

- 1) *Disaster Management - Harsh K Gupta*
- 2) *Disaster Management - Damon.P*

21OEL638**ESSENTIALS OF CULTURAL STUDIES****2 0 0 2**

Uniqueness of Indian culture.
Real Indian History.
Heritage – spiritual and cultural heritage.
Glory of ancient India – inventions and discoveries in all fields.
Importance of festivals.

REFERENCE TEXTS:

1. *Swami Harshananda – Hindu Culture*
2. *Amma – Eternal Truth*

21OEL639**FOUNDATIONS OF MATHEMATICS****2 0 0 2**

Objectives: To develop an understanding of problem solving methods, to understand the basic concepts of mathematics and to apply the results to real life business problems

Unit 1

Matrices: Type of matrices, addition, subtraction, multiplication of matrices, transpose, determinant of a matrix, adjoint and inverse of a matrix.

Unit 2

System of equations - Solution of equations in one(linear, quadratic), two and three variables, Solution of a system of linear equation having unique solution and involving not more than three variables by matrix method, Cramer's rule.

Unit 3

Financial mathematics: Simple interest and compound interest.

Unit 4

Simple differentiation: functions, simple differentiation of algebraic functions, first and second order derivatives, maxima and minima.

Unit 5

Elementary integral calculus: Integration of simple algebraic functions.

REFERENCES:

1. *P.R Vittal - Business mathematics and statistics, Margham Publications, Chennai.*
2. *Dr. Amarnath Dikshit, Dr. Jinendra Kumar Jain - Business mathematics, Himalaya publishing House.*
3. *V.K Kapoor - Introductory Business mathematics, Sultan chand & Sons, New Delhi.*

21OEL640**FOUNDATIONS OF QUANTUM MECHANICS****2 0 0 2****Unit 1**

Historical Perspective of Quantum Physics: Failure of classical mechanics - Planck-Einstein, Bohr-de Broglie-Heisenberg's Uncertainty.

Unit 2

Empirical confirmations of Wave Particle Duality. Schrödinger Equation - Particle in a box-Tunnel effect.

Unit 3

Paradoxes in QM - de Broglie paradox - Schrödinger's cat, Mach-Zehnder type interferometers - EPR paradox - Bell-type Inequalities.

Unit 4

Various interpretations - Statistical, Copenhagen, Bohm's formulation, Transactional, Wheeler's Participatory Universe, Many World, Decoherence, consciousness interpretation.

Unit 5

Uncertainty-Nonlocality, Holistic universe, Violations of causality-Retro influence-Philosophy of Advaita (non-Duality).

TEXT AND REFERENCES:

1. *Quantum Enigma: Physics Encounters Consciousness by Bruce Rosenblum and Fred Kuttner (Aug 1, 2011)*

21OEL641 GLIMPSES OF LIFE THROUGH LITERATURE 2002

Unit 1

- 1 Introduction – What literature is – Language and literature – Indian literature – Values through literature – Literature and culture – Enjoying literature
- 2 Father Giligan – WB Yeats

Unit 2

- 3 The West Wind – PB Shelley
- 4 Chicago Address – Swami Vivekananda

Unit 3

- 5 On Saying Please – AG Gardiner
- 6 My Lost Dollar – Stephen Leacock
- 7 The Importance of Being Earnest – Oscar Wilde (extracts)

Unit 4

- 8 The Refugee – AK Abbas
- 9 The Mirrored Hall – Swami Chinmayananda

Unit 5

- 10 The Windhover – GM Hopkins

21OEL642 INFORMATION TECHNOLOGY IN BANKING 2002

Objective: *To provide an understanding on the technology enabled banking services and their applications.*

Unit 1

Bank and Banking: Meaning and definition, development of banking in India, types banks, banking systems, types of banking systems, commercial banks, functions, nationalization of commercial banks in India.

Unit 2

Central Banking, functions, Reserve Bank of India, State Bank of India.

Unit 3

Banker and Customer, opening an account, Pass Book and Pay-in Slip, Cheques, types of cheques, crossing of cheques.

Unit 4

Role of information technology in banking services, Core Banking, Automated Teller Machine (ATM), Electronic Clearing Service (ECS), NEFT and RTGS, Mobile Banking.

Unit 5

Debit Card and Credit Card, banking and E-Commerce, Point of Sales (PoS), Online bill payment and ticket reservation – future of electronic banking.

REFERENCE BOOKS:

1. *Sundaram and Varshney – Banking Law, Theory and Practice, Sultan Chand*
2. *B. Santhanam – Banking and Financial Systems, Margham Publications*
3. *S.N. Maheswari – Banking Law, Theory and Practice, Kalyani Publications*
4. *Parameswaran – Indian Banking, S.Chand and Co*

21OEL643 KNOWLEDGE MANAGEMENT 2002

Objective: *To enable students to understand the basics of Knowledge Management and its applications in organizations*

Unit 1

Knowledge management concepts – Introduction - Definitions of Knowledge – Data-information and knowledge - basic thoughts on knowledge - difference between wisdom and knowledge - information Management and knowledge Management - hierarchy model - knowledge types – explicitness – reach - abstraction level – propositionality – Earl's schools of knowledge management.

Unit 2

Knowledge management and process - Becerra-Fernandez and Stevenson knowledge process - Nonaka's Knowledge Spiral – dynamics of knowledge creation – knowledge management systems – knowledge management sub – processes – knowledge discovery – knowledge capture – knowledge sharing –knowledge application.

Unit 3

Organizational knowledge – Need – benefits - components and functions - Knowledge management in virtual organizations - knowledge management in professions - a study of IT and ITES business - knowledge management system requirements - Organizational knowledge measurement techniques - organizational implementation barriers.

Unit 4

Designing Enterprise Knowledge Management System architecture – Multi-layer architecture for Knowledge Management Systems - knowledge management in decentralized and heterogeneous corporations - Web based knowledge management support for document collections.

Unit 5

Recent Tools for KM - Intelligent support systems - intelligent systems and artificial intelligence - comparing artificial and neural intelligence - conventional vs. Artificial intelligence - Emerging technology - virtual reality - Intellectual capital.

TEXTBOOKS AND REFERENCES:

1. *Knowledge Management – Sudhir Warier, Vikas Publications.*
2. *Knowledge Management Systems – Stuart Barnes, Thomson Learning.*
3. *Key issues in the New Knowledge Management – J.M. Firestone, M.W. Mcelroy.*
4. *Developing Expert System for Business – Chandler/Liang.*
5. *Knowledge Management – Pankaj Sharma, APH Pub*

21OEL644

MARKETING RESEARCH

2 0 0 2

Objective: To provide a basic knowledge on research methodology and market research.

Unit 1

Definition of Marketing Research, Objective of Marketing Research, Application of Marketing Research, Limitation of Marketing Research, Marketing Research Process.

Unit 2

Research Design: Various Method of Research Design, Important Experimental Research Designs.

Primary and Secondary Data: Methods of Collecting Primary Data, Advantages & Disadvantages of Primary Data & Secondary Data, Essentials Characteristics for Selecting Secondary Data. Basic Methods of Collecting Data: Questionnaire Method/ Observation Method - Advantages & Disadvantages, Methods of Observation, Precautions in Preparation of Questionnaire & Collection of Data.

Unit 3

Measurement and Scaling: Types of Scales, Difficulty of Measurement, Sources of Error, Criteria for a Good Scale, Development of Marketing Measures.

Sampling: What is Sampling, Objective of Sampling, Steps in Sample Design, Various Techniques of Sampling, Advantages & Disadvantages of Different Techniques of Sampling, Difference between Probability and Non-probability Sampling, Problem Associated with Sampling, Determining Sample Size.

Unit 4

Data Processing, Analysis and Estimation

Unit 5

Report Preparation: Types and Layout of Research Report; Precautions in Preparing the Research Report, Bibliography and Annexure in Report, Drawing Conclusions, Giving Suggestions and Recommendation to the Concerned Persons.

REFERENCE TEXTS:

1. *Nargundkar - Marketing Research, Tata McGraw Hill, 2nd Ed.*
2. *Luck and Rubin - Marketing Research, Prentice Hall of India, 7th Ed.*
3. *Tull & Hawkins - Marketing Research: Measurement & Method, Prentice Hall of India, 6th Ed.*
4. *Beri - Marketing Research, Tata McGraw Hill, 4th Ed.*

21OEL645

MEDIA FOR SOCIAL CHANGE

2 0 0 2

Unit 1 Health Communication

Introduction to theories in Health Communication. Awareness on Health Issues – Epidemic Diseases, knowledge about vaccination

for various diseases - Health campaign will be organized with the help of Medical Practitioner.

Unit 2 Radio for Social Change

Awareness on Edaphic Issues - Soil Pollution, Water Pollution and other forms of pollution. Anti-Pollution campaign will be organized with the help of Environmental Scientist or Journalist.

Unit 3 Social Media Activism

Awareness on Blood Donation – How a tiny red drop makes someone's life Green. Awareness campaign will be organized based on Eye Donation.

Unit 4 Development Communication and Social Learning

Locating the remote village where basic amenities like Water, Toilet facilities are not available - A campaign with the involvement of government officials and social scientists.

Unit 5 Participatory Communication for Social Change

Organic Farming - Awareness of Organic Farming. Benefits of organic farming in the materialistic world. A campaign cum workshop will be conducted by inviting experts from Agricultural Husbandry.

REFERENCES

1. Tillman, C. (2006). *Principles of occupational health and hygiene: an introduction*. Allen & Unwin.
2. Thayer, Lee, (2014) *Mental Hygiene: Communication and the Health of the Mind*.
3. Harrison, R. M. (2001). *Pollution: causes, effects and control*. Royal Society of Chemistry. Wilhelm, J. (2016). *Environment and Pollution in Colonial India: Sewerage Technologies Along the Sacred Ganges*. Routledge.
4. Charbonneau, J., & Smith, A. (Eds.). (2015). *Giving Blood: The Institutional Making of Altruism*. Routledge.
5. Agarwal, Arun K (2007) *Standard Operating Procedures(sop) For Hospitals In India*. New Delhi: Atlantic Publishers
6. Hall-Matthews, D. N. J. (2005). *Peasants, Famine and the State in Colonial Western India*.
7. Basingstoke: Palgrave Macmillan.
9. Thottathil, S. E. (2014). *India's Organic Farming Revolution: What it Means for Our Global Food System*. University of Iowa Press.

21OEL646

MEDIA MANAGEMENT

2 0 0 2

Unit 1

Management concept – Principles of Management - Factors influencing Management decision in media – Structure and characteristics of media organizations – Newspapers and Magazines, Radio, Television, Cinema - Ownership in Media Industries – Merits and de-merits.

Unit 2

Economics of newspaper – Advertising vs circulation – Management problems of small, medium, large newspapers: gathering, processing, printing, circulation, distribution, advertising, professionalism, trade unionism, News room diversity.

Unit 3

Economics and Administrative concerns of government owned electronic media-market driven media: private channels – Social commitment vs Profit making.

Unit 4

Economics of film Industry – creativity, production, marketing distribution, exhibition, ownership vs piracy.

Unit 5

News agencies and syndicates: Ownership and organization structures – committees to study the problems of various media in India.

BOOKS RECOMMENDED:

1. Aggarwal S.K : *Press at the crossroads in India*.
2. William and Rucker: *Newspaper Organization and Management*
3. Sarkar R.C: *The press in India*
4. Noorani A.G: *Freedom of Press in India*
5. Frank Thayer: *Newspaper Management*
6. Gulab Kothari: *Newspaper Management in India*
7. *Reports of the enquiry committees appointed by the Ministry of Information and Broadcasting.*

21OEL647

OBJECT-ORIENTED PROGRAMMING

2 0 0 2

Unit 1

Introduction to OOPS: Object Oriented Programming features, Applications, History, Difference from structured Programming,

Object Oriented Programming Languages, Program execution.

Unit 2

Object Oriented Concepts: Abstraction, Encapsulation, Polymorphism, Inheritance, Classes and Objects, Programming Basics - Data types, Conditional Statements, Loops, arrays, Functions, Structures.

Unit 3

Implementing Class, Object Data Types, User Defined Data Types, Defining a Class, e Access specifiers, The Scope Resolution Operator, Using Class Objects Like Built-in Types, Scope, Constructors, Member Initialization, Constructor Overloading, Destructors.

Unit 4

Inheritance: Introduction, The protected Access Level, Assignments Between Base and Derived Objects, Types of Inheritance, Compile-Time vs. Run-Time Binding, virtual Functions, Polymorphism, Abstract Base Classes.

Unit 5

The iostream Library, Predefined Streams, Stream States, Formatted I/O, Disk Files, Reading and Writing Objects.

TEXTBOOKS

1. E Balaguruswamy "Object Oriented Programming Using C++" 6th Edition, TMH Publications
2. Lalit Kishore Arora , Dr. Vikesh Kumar, " Object Oriented Programming Using C++ ",S.K. Kataria & Sons; 2011 edition (2011)

21OEL648

PAINTING AND SCULPTURE

1 0 1 2

Objective: To make students develop critical thinking skill as well as make them creative in their field of painting and sculpture.

Unit 1

Pencil drawing, life study.

Unit 2

Basics of water colour painting, Clay modelling.

Unit 3

Anatomy and figure study, Basics of oil and acrylic painting.

Unit 4

Basics of Figure modeling.

Unit 5

Moulding and casting.

REFERENCE BOOKS

1. Indian Sculpture and Painting – by E.B. Havell (Author)
2. Modern Painting And Sculpture: 1880 To Present From The Museum Of Modern Art – by John Elderfield (Editor)

21OEL649

PERSONAL FINANCE

2 0 0 2

Objective: To analyse the process of making personal financial decisions, develop personal financial goals and identify the strategies for their achievement.

Unit 1

Basics of Personal Financial Planning, Time Value of Money, Planning tax strategies.

Unit 2

Introduction to Consumer Credit, sources of credit, Consumer Purchasing, strategies for housing decisions.

Unit 3

Insurance: types, selecting the right insurance policy, property and motor vehicle insurance, health insurance policies, Retirement Planning, NPS.

Unit 4

Investing fundamentals, investing in shares, bonds and mutual funds, investment in gold and real estate.

Unit 5

Investing in Schemes of Government: National Savings Certificates, KVP, Post Office Recurring Deposits and term deposits, PPF.

REFERENCE TEXTS:

1. Jeff Madura – *Personal Finance*, Pearson Education
2. Manish Chauhan – *16 Personal Finance Principles every Investor should know*, Network18 Publishers
3. Jack R Kapoor, Les R Dlabey – *Personal Finance*, McGraw Hill

21OEL650

PRINCIPLES OF ADVERTISING

2 0 0 2

Objective: *The objective of this paper is to help student to make basic understanding on advertising, providing understanding on the processes behind successful advertising. The students are introduced to the processes, tools and techniques used in developing advertising concepts with the study areas including creative thinking and visualizing.*

Unit 1 Introduction

History of advertising, Advertising-meaning and definition, Advertising as a tool of communication, Features of advertising.

Unit 2 Types of Media – Advantages & Disadvantages

Types of advertising, Types of media in advertising – Features – advantages – disadvantages – Print, Television, Radio, Internet, OOH.

Unit 3 Structure of an Advertising Agency

Structure of advertising agency – Small, Medium, National, In-house.

Unit 4 Other Promotion

Sales Promotion, Direct Marketing, Public Relations, Publicity and Corporate Advertising, Unconventional Promotional Media.

Unit 5 Case Studies

REFERENCE BOOKS:

Advertising, Frank Jefkins Revised by Daniel Yadin
Kleppner's Advertising Procedure

21OEL651

PRINCIPLES OF PACKAGING

2 0 0 2

Objective: *To analyse the process of making personal financial decisions, develop personal financial goals and identify the strategies for their achievement.*

Unit 1

Packaging: Meaning and importance, functions, marketing considerations of packaging.

Unit 2

Design of package, materials used for packaging, selection criteria of packaging materials, packing techniques.

Unit 3

Packaging systems, future of packaging.

Unit 4

Provisions of the Legal Metrology (Packaged Commodities) Rules 2011.

Unit 5

Provisions of Food Safety Standards (Packaging and Labelling) Regulations, 2011.

REFERENCE TEXTS:

1. Gordon Robertson – *Food Packaging: Principles and Practice*, CRC Press
2. Frank Paine – *A Handbook of Food Packaging*, Springer

21OEL652 SCRIPTING FOR RURAL BROADCASTING 1 0 1 2

Unit 1

Introduction to rural broadcasting. Rural life and issues. Cultural ecology - Anthropological approaches - traditional social activities-translocal ruralistic features. Practical: Visit any rural area for making detail analysis on the topics during weekends.

Unit 2

Rural communities. Analysis of social and political life in a rural community. Caste / class dynamics and regional influences.

Unit 3

Scope and Impact of broadcast journalism in rural development. Two day workshop by an external expert from the broadcast industry on the rudiments of script writing focusing on rural aspects/ communities.

Unit 4

Practice on Scripting. Focus on covering special issues concerning rural women, youth, farmers, self-help groups cottage industries etc.

Unit 5

Developing the final script for rural broadcasting that will have practical application in the field. Final evaluation by the external expert.

REFERENCES

1. Eschenbach, J. (1977). *The role of broadcasting in rural communication*.
2. Friedrich-Ebert-Stiftung. George, A. M. (2004). *India untouched: The forgotten face of rural poverty*. East West Books.
3. Kumar, K. (2003). *Mixed signals: Radio broadcasting policy in India*. *Economic and political weekly*, 2173-2182.
4. Maddison, J. (1971). *Radio and television in literacy*. Unesco.
5. Manyozo, L. (2011). *People's radio: communicating change across Africa*. *Southbound Penang*
6. Neurath, P. M. (1962). *Radio farm forum as a tool of change in Indian villages*. *Economic Development and Cultural Change*, 10(3), 275-283.
7. Onabajo, F. (2003). *37 Message Design & the Appropriateness of Language in Rural Broadcasting*. *Four Decades in the Study of Languages & Linguistics in Nigeria*: O'Hare, K. (1992). *Scripts: Writing for Radio and Television*. *Canadian Journal of Communication*, 17(4).
8. Sharma, A., & Kashyap, S. K. (2013). *Information need assessment for empowering rural women through community radio programmes: A study in Tarai region of Uttarakhand*. *Journal of Community Mobilization and Sustainable Development*, 8(2), 169-173.

21OEL653 SOCIAL MEDIA WEBSITE AWARENESS 1 0 1 2

Objectives; To understand the history, theory, technology and uses of social media; to create, collaborate, and share messages with audiences of all sizes; to know and explore the possibilities and limitations of social media. Hands on experience with several forms of social media technology; to understand and use social media productively and to evaluating new tools and platforms.

Unit 1

Introduction to Social media; Definition - Social Media and Digital transformation; Social Networking and online communities; Social support and service; Wikipedia, Facebook, Instagram, Tagging, LinkedIn; Social mobile applications; Security settings in Facebook, Whatsapp.

Unit 2

Blogging – History; Creating blog, effect of blogging, micro blogging; Protocol, Platform, Content strategies.

Unit 3

Tweeting - Introduction, History, Protocol; Twitter; Twitter apps; Managing Twitter; #hashtag# creation and following; Security settings in Twitter.

Unit 4

Social media sharing – History, Protocol; YouTube, Flickr, Slide share, Social news; News apps – Newshunt and others; Bookmarking - History, Digg, Reddit, Delicious.

Unit 5

Social theory in the information age; Social Network for professional, business, Digital Marketing; Using social networking sites for

research, Security aspects of social networking.

REFERENCES:

1. *Social Networking - Digital and Information Literacy Series* by Peter K. Ryan, The Rosen Publishing Group, 2011 ISBN 1448823463, 9781448823468
2. *The Social Media Marketing Book* Dan Zarrella "O'Reilly Media, Inc.", 13-Nov-2009

21OEL654

THEATRE STUDIES

1 0 1 2

Objective: To provide students with a firm grounding in the discipline of Theatre and Performance Studies.

Unit 1

Breathing exercises, warming up exercises.

Unit 2

Voice modulation, Monologue practice.

Unit 3

Facial expressions, emoting a character.

Unit 4

Stage direction, Makeup and costumes.

Unit 5

Choreography, Producing a play.

REFERENCES:

1. *Theatre as Sign System: A Semiotics of Text and Performance* by Elaine Aston, George Savona
2. *Theatre Semiotics: Text and Staging in Modern Theatre* by Fernando de Toro
3. *Acting For Real: Drama Therapy Process, Technique, and Performance* by Renee Emunah

21OEL655

WRITING FOR TECHNICAL PURPOSES

2 0 0 2

Overview: The course aims at developing skills that will enable students to produce clear and effective scientific and technical documents as required in their work-life. Though the focus of the course is on writing, oral communication of scientific and technical information forms an important part of the course.

Objectives: To familiarize the students with the requirements of effective technical writing; to enable students to independently work on their publication and presentation of papers; developing skills required for presentation of reports, papers and proposals

Unit 1

What is Technical Writing? - Purpose and characteristics of technical writing and need for developing technical writing skill. Use of Technical terms, Defining terms, Style and tone.

Unit 2

Use of resources, documentation style and citation; Standard operation procedures, Instruction Manuals and Handbooks.

Unit 3

Oral presentations, Analysis of published papers – format, content and style.

Unit 4

Drafting a research paper for publication; Grammar check and editing; proof reading.

Unit 5

Submission of term paper.

REFERENCE BOOKS:

1. McMurrey David, *Technical Writing*,
2. Manser Martin H. *Guide to Style: an essential guide to the basics of writing style*, Viva books

21OEL656

YOGA AND PERSONAL DEVELOPMENT

1 0 1 2

Objective: To give an understanding on the concept and advantages of yoga and simple yoga practices.

Unit 1

Yoga and Modern Life – Introduction - understanding Yoga – definition - four streams of yoga - Why yoga?

Unit 2

Breath – The Bridge – Introduction - Breathing Practices – Standing - Sitting – Supine.

Unit 3

Loosen Yourself – Introduction – Jogging – Bends - Twisting – Pavanamuktasana Kriya.

Unit 4

Asanas – Suryanamaskar - Standing Posture - Sitting postures - Prone Postures - Supine – Topsy Turvy - Relaxation techniques.

Unit 5

Pranayama, Meditation.

REFERENCE TEXTS:

1. N.S. Ravishankar – *Yoga for Health, Pustak Mahal*
2. BKS Iyengar – *Yoga: The Path to Holistic Health, DK Publishers*

21OEL657 FUNDAMENALS OF LEGAL AWARENESS

2002

Objective: This course is intended to give the student the power to make a difference in personal and professional life through sound legal knowledge and to be aware of rights and responsibilities towards society and nation.

Unit 1

Law and classification: definition, meaning, functions, classification- public and private law, civil law and criminal law, substantive and procedural law, municipal and international law, written and unwritten laws

Unit 2

Law of contracts: overview of Indian Contract Act, definition, meaning, essentials-offer and acceptance, invitation to offer, cross offers, intention to create legal obligation, lawful consideration, lawful object, competency of parties, free consent, agreement not to be void, illegal, immoral or opposed to public policy, agreement v. contract, breach and remedies for breach.

Unit 3

Law of torts: Definition, meaning, essentials, damages- injuria sine damnum and damnum sine injuria, general defences in torts, exceptions to tortious liability: vicarious liability- master servant relationship, Principal- agent relationship, Partner- partnership firm, Major torts: Nuisance, Negligence
Tress pass: Tresspass to a person- Battery, Assault, False Imprisonment, defamation- libel and slander, essentials, defences to defamation, liability in torts- strict liability, absolute liability, damages in torts-meaning, types of damages- nominal, compensatory, exemplary, aggravated, prospective, contemptuous

Unit 4

Criminal law: introduction of criminal law- subject matter, General introduction to the Indian Penal Code, Criminal Procedure code, Indian Evidence Act, mental element- stages of crime, guilty intention, General exceptions- Intoxication, Insanity, Mistake of Fact, Accident, Acts done under compulsion, public duty etc., Right of Private Defence, Major offences: Theft, Extortion, Robbery, Dacoity, Sedition, Abduction, Kidnapping, Unlawful Assembly, Dowry Death, Abetment, Murder, Culpable Homicide

Unit 5

Family law: subject matter and Introduction, Laws Involved, Marriage – validity and degree of prohibited relationship, Divorce Family Court, Grounds for divorce, orders- judicial separation, restitution of conjugal rights, maintenance, Section 125 Criminal Procedure code, Adoption- difference between guardianship and adoption, General outline of Hindu Adoption and Maintenance Act, Guardianship and Wards Act, Succession- Testamentary and Intestate- Testator, Executor, Administrator and Probate