

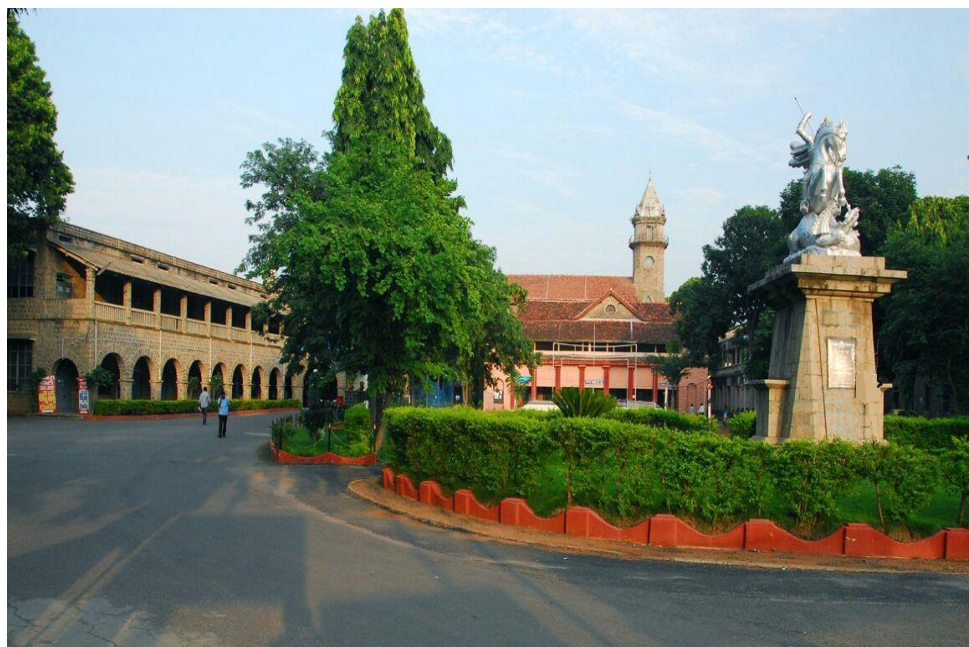


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Criterion: I

Metric: 1.3.1



Criterion –I Curricular Aspects

1.3 Curriculum Enrichment

ENVIRONMENT SUSTAINABILITY

w. e. f 2015-2016

&

w. e. f 2020-2021

Foundation Course-2

ENVIRONMENTAL STUDIES

Common for BA/BCom/BSc/BBA/BCA
Programmes w. e. f 2015-16

Semester-I

(Total 30 Hours)

Unit-I: Natural Resources

6 Hrs

Definition, scope and importance. Need for public awareness. Brief description of Forest resources: Use and over-exploitation. Deforestation; timber extraction, mining, dams. Effect of deforestation environment and tribal people

- ☐ Water resources: Use and over-utilization. Effects of overutilization of surface and groundwater. Floods, drought.
- ☐ Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.
- ☐ Food resources: World food problems, Effects of modern agriculture; fertilizer-pesticide, salinity problems.

Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources.

- ☐ Land resources: Land as resources, land degradation, man induced landslides, soil erosion and desertification

Unit-II: Ecosystems, Biodiversity and its conservation

6Hrs

Concept of an ecosystem

Structure and function of an

- ☐ ecosystem Producers, consumers and decomposers
- ☐ Food chains, food webs and ecological pyramids
- ☐ Characteristic features of the following ecosystems:-
Forest ecosystem, Desert ecosystem, Aquatic ecosystem.

Value of biodiversity: Consumptive use, productive use. Biodiversity in India. Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife

- ☐ conflicts.
- ☐ Endangered and endemic species of India
- ☐ Conservation of biodiversity

Unit-III: Environmental Pollution

6Hrs

Definition

Causes, effects and control measures of:-

- ☐ a. Air pollution
- ☐

- b. Waterpollution
- c. Soilpollution
- d. Noisepollution
- ☐ Solidwastemanagement;MeasuresforsafeurbanandindustrialwastedisposalRoleofin
- ☐ dividualinpreventionofpollution
- ☐ Disastermanagement:Drought,floodsandcyclones

Unit-IV: Social Issues and the Environment

6Hrs

- ☐ FromUnsustainabletoSustainabledevelopment
- ☐ Waterconservation,
- ☐ rainwaterharvesting,watershedmanagement.Climate
- ☐ change,globalwarming,ozonelayerdepletion,Environmentprotectio
- ☐ nAct
- WildlifeProtectionAct,ForestConservationAct

Unit-V: Human Population and the Environment

6Hrs

- ☐ Populationexplosion,impactonenvironment.
- ☐ Family welfare
- ☐ ProgrammeEnvironment and
- ☐ human healthWomenand
- ☐ ChildWelfareValueEducation
- ☐ RoleofInformationTechnologyinEnvironmentand humanhealth.

ReferenceBooks:

1. Environmental Studies by Dr.M.Satyanarayana, Dr.M.V.R.K.Narasimhacharyulu, Dr.G.RambabuandDr.V.VivekaVardhani,Published byTeluguAcademy,Hyderabad.
 2. EnvironmentalStudiesbyR.C.Sharma,GurbirSangha,publishedbyKalyaniPublishers.
 3. EnvironmentalStudiesbyPurnimaSmarath,publishedbyKalyaniPublishers.
-

ELECTIVE PAPER-VII-(B): ENVIRONMENTAL CHEMISTRY

UNIT-I

45 hrs (3h/w)

Introduction

9h

Concept of Environmental chemistry - Scope and importance of environment in nowadays - Nomenclature of environmental chemistry - Segments of environment - Natural resources - Renewable Resources - Solar and biomass energy and Non renewable resources - Thermal power and atomic energy - Reaction of atmospheric oxygen and Hydrological cycle.

UNIT-II

Air Pollution

9h

Definition - Sources of air pollution - Classification of air pollution - Acid rain - Photochemical smog - Green house effect - Formation and depletion of ozone - Bhopal gas disaster - Controlling methods of air pollution.

UNIT-III

Water pollution

9h

Unique physical and chemical properties of water - water quality and criteria for finding of water quality - Dissolved oxygen - BOD, COD, Suspended solids, total dissolved solids, alkalinity - Hardness of water - Methods to convert temporary hard water into soft water - Methods to convert permanent hard water into soft water - eutrophication and its effects - principal waste treatment - Industrial waste water treatment.

UNIT-IV

Chemical Toxicology

9h

Toxic chemicals in the environment - effects of toxic chemicals - cyanide and its toxic effects - pesticides and its biochemical effects - toxicity of lead, mercury, arsenic and cadmium.

UNIT-V

Ecosystem and biodiversity

9h

Ecosystem

Concepts - structure - Functions and types of ecosystem - Abiotic and biotic components - Energy flow and Energy dynamics of ecosystem - Food chains - Food web - Trophic levels - Biogeochemical cycles (carbon, nitrogen and phosphorus)

Biodiversity

Definition - level and types of biodiversity - concept - significance - magnitude and distribution of biodiversity - trends - biogeographical classification of India - biodiversity at national, global and regional level.

List of Reference books

1. Fundamentals of ecology by M. C. Dash
 2. A Textbook of Environmental chemistry by W. Moore and F. A. Moore
 3. Environmental Chemistry by Samir K. Banerji
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SEMESTER-VI

ELECTIVE PAPER-VII-(C) GREEN CHEMISTRY

45 hrs (3 h/w)

UNIT-I

10h

Green Chemistry: Introduction- Definition of green Chemistry, need of green chemistry, basic principles of green chemistry. Green synthesis- Evaluation of the type of the reaction i) Rearrangements (100% atom economic), ii) Addition reaction (100% atom economic). Organic reactions by Sonication method: apparatus required examples of Sonochemical reactions (Heck, Hunsdiecker and Wittig reactions).

UNIT-II

10h

Selection of solvent: i) Aqueous phase reactions ii) Reactions in ionic liquids, Heck reaction, Suzuki reactions, epoxidation. iii) Solid supported synthesis

Supercritical CO₂: Preparation, properties and applications, (decaffeination, dry cleaning)

UNIT-III

10h

Microwave and Ultrasound assisted green synthesis: Apparatus required, examples of MAOS (synthesis of fused anthraquinones, Leukart reductive amination of ketones)- Advantages and disadvantages of MAOS. Aldol condensation-Cannizzaro reaction-Diels-Alder reactions-Strecker's synthesis

UNIT-IV

5h

Green catalysis: Heterogeneous catalysis, use of zeolites, silica, alumina, supported

UNIT V

10h

Examples of green synthesis / reactions and some real world cases: 1. Green synthesis of the following compounds: adipic acid, catechol, disodium iminodiacetate (alternative Strecker's synthesis) 2. Microwave assisted reaction in water – Hoffmann elimination – methyl benzoate to benzoic acid – oxidation of toluene and alcohols – microwave assisted reactions in organic solvents. Diels-Alder reactions and decarboxylation reaction. 3. Ultrasound assisted reactions – sonochemical Simmons-Smith reaction (ultrasonic alternative to iodine)

Referencebooks:

1. GreenChemistryTheoryandPractice.P.T.AnatasandJ.C.Warner
2. GreenChemistryV.K.AhluwaliaNarosa, NewDelhi.
3. RealworldcasesinGreenChemistryM.C.CannandM.E. Connelly
4. GreenChemistry:IntroductoryTextM.Lancaster:RoyalSocietyofChemistry(London)
5. GreenChemistry:IntroductoryText,M.Lancaster
6. GreenChemistry:EnvironmentalfriendlyalternativesRSSanghliandM.M.Srivastava,Narosa Publications

LABORATORYCOURSE–VIIGREENCHEMISTRY

Practical Paper– ElectiveVIIC (at the end of semesterVI) 30hrs(2h/W)

1. Determinationofspecificreactionrateofhydrolysisformethylacetatecatalysedbyhydrogenionatroomtemperature.
 2. DeterminationofmolecularstatusandpartitioncoefficientofbenzoicacidinBenzeneandwater.
 3. Surfacetensionandviscosityofliquids.
 4. Adsorptionofaceticacidonanimalcharcoal,verificationof Freundlischisotherm.
-

Total hours of teaching 60 hrs @ 3 hrs per week

UNIT-I. Elements of Ecology (12hrs)

1. Ecology: definition, branches and significance of ecology.
2. Climatic Factors: Light, Temperature, precipitation.
3. Edaphic Factor: Origin, formation, composition and soil profile.
4. Biotic Factor: Interactions between plants and animals.

UNIT-II. Ecosystem Ecology (12 hrs)

1. Ecosystem:
Concept and components, energy flow, Food chain, Food web, Ecological pyramids.
2. Productivity of ecosystem- Primary, Secondary and Net productivity.
3. Biogeochemical cycles- Carbon, Nitrogen and Phosphorous.

UNIT-III Population & Community Ecology (12hrs)

1. Population - definition, characteristics and importance, outlines – ecotypes.
2. Plant communities- characters of a community, outlines –
Frequency, density, cover, life forms, competition.
3. Interaction between plants growing in a community.

UNIT-IV Phytogeography (12hrs)

1. Principles of Phytogeography, Distribution (wides, endemic, discontinuous species)
2. Phytogeographic regions of India.
3. Phytogeographic regions of World.
4. Endemism – types and causes

UNIT-V: Plant Biodiversity and its importance (12)

1. Definition, levels of biodiversity- genetic, species and ecosystem.
2. Biodiversity hotspots- Criteria, Biodiversity hotspots of India.
3. Loss of biodiversity – causes and conservation (*In-situ* and *ex-situ* methods).
4. Seed banks- conservation of genetic resources and their importance

Suggested activity: Collection of different soils, studying their texture, observing polluted water bodies, student study projects, debates on man's activity on ecosystem and biodiversity conservation methods, visiting an area of natural vegetation. Visit to NGO, working in the field of biodiversity and report writing; to study Honey Bees and plants yielding honey.

BooksforReference:

1. Daubenmire, R.F.():Plants&Environment(2ndEdn.,)JohnWiley&Sons.,NewYork
2. Puri,.G.S.(1960):IndianForestEcology(Vol.I&II)OxfordBookCo.,NewDelhi &Calcutta.
3. Billings,W.B.(1965):PlantsandtheEcosystemWadsworthPublishingCo.,Inc.,Belmont.
4. Misra,R.(1968): TheEcologyworkBookOxford&INHPublishingCo.,Calcutta
5. OdumE.P.(1971):
FundamentalsofEcology(2ndEdn.,)Saunders&Co.,Philadelphia&NatrajPublishers,Dehradun.
6. OdumE.P.(1975):EcologyByHolt,Rinert&Winston.
7. Oosting,H.G.(1978):PlantsandEcosystemWadsworthBelmont.
8. Kochhar,P.L.(1975):PlantEcology.(9thEdn.,)NewDelhi,Bombay,Calcutta-226pp.,
9. Kumar,H.D.(1992): ModernConceptsofEcology(7thEdn.,)VikasPublishingCo.,NewDelhi.
10. Kumar H.D. (2000): Biodiversity & Sustainable Conservation Oxford & IBH PublishingCoLtd.NewDelhi.
10. Newman,E.I.(2000):AppliedEcologyBlackwellScientificPublisher,U.K.
11. Chapman, J.I&M.J. Reiss (1992): ecology (Principles & Applications).CambridgeUniversityPress,U.K.
12. Cain,S.A.(1944):FoundationsofPlantGeography Harper&Brothers,N.Y.
13. Mani, M.S (1974): Ecology & Biogeography of IndiaDr.W. Junk Publishers, The HagueGood,R.(1997):TheGeographyoffloweringPlants(2ndEdn.)Longmans

Elective VII-(C): (Renewable Energy)

Semester–VI

Elective Paper–VII-(C): Renewable Energy

No. of Hours per week: 04

Total

Lectures: 60 UNIT-I (12hrs)

1. **Introduction to Energy:** Definition and units of energy, power, Forms of energy, Conservation of energy, second law of thermodynamics, Energy flow diagram to the earth. Origin and time scale of fossil fuels, Conventional energy sources, Role of energy in economic development and social transformation.
2. **Environmental Effects:** Environmental degradation due to energy production and utilization, air and water pollution, depletion of ozone layer, global warming, biological damage due to environmental degradation. Effect of pollution due to thermal power station, nuclear power generation, hydroelectric power stations on ecology and environment.

UNIT-II (12hrs)

3. **Global Energy Scenario:** Energy consumption in various sectors, projected energy consumption for the next century, exponential increase in energy consumption, energy resources, coal, oil, natural gas, nuclear and hydroelectric power, impact of exponential rise in energy usage on global economy.
4. **Indian Energy Scene:** Energy resources available in India, urban and rural energy consumption, energy consumption pattern and its variation as a function of time, nuclear energy - promise and future, energy as a factor limiting growth, need for use of new and renewable energy sources.

UNIT-III (12hrs)

5. **Solar energy:** Solar energy, Spectral distribution of radiation, Flat plate collector, solar water heating system, Applications, Solar cooker. Solar cell, Types of solar cells, Solar module and array, Components of PV system, Applications of solar PV systems.
6. **Wind Energy:** Introduction, Principle of wind energy conversion, Components of wind turbines, Operation and characteristics of a wind turbine, Advantages and disadvantages of windmills, Applications of wind energy.

UNIT-IV (12hrs)

7. **Ocean Energy:** Introduction, Principle of ocean thermal energy conversion, Tidal power generation, Tidal energy technologies, Energy from waves, Wave energy conversion, Wave energy technologies, advantages and disadvantages.
8. **Hydrogen Energy:** History of hydrogen energy - Hydrogen production methods - Electrolysis of water, Hydrogen storage options – Compressed and liquefied gas tanks, Metal hydrides; Hydrogen safety - Problems of hydrogen transport and distribution - Uses of hydrogen as fuel.

UNIT-V (12hrs)

9. **Bio-Energy:** Energy from biomass – Sources of biomass – Different species – Conversion of biomass into fuels – Energy through fermentation – Pyrolysis, gasification and combustion – Aerobic and anaerobic bio-conversion – Properties of biomass – Biogas plants – Types of plants – Design and operation – Properties and characteristics of biogas.

References:

1. Solar Energy Principles, Thermal Collection & Storage, S.P. Sukhatme: Tata McGraw Hill Pub., New Delhi.
2. Non-Conventional Energy Sources, G.D. Rai, New Delhi.
3. Renewable Energy, power for a sustainable future, Godfrey Boyle, 2004,
4. The Generation of electricity by wind, E.W. Golding.
5. Hydrogen and Fuel Cells: A comprehensive guide, Rebecca Busby, Pennwell Corporation
6. Hydrogen & Fuel Cells: Emerging Technologies & Applications, B. Sorensen, Acad Press
7. Non-Conventional Energy Resources by B.H. Khan, Tata McGraw Hill Pub., 2009.
8. Fundamentals of Renewable Energy Resources by G.N. Tiwari, M.K. Ghosal, Narosa Pub., 2007.

Elective Paper-VII-

C: Practical: Renewable Energy 2hrs/Week

Minimum of 6 experiments to be done and recorded

1. Preparation of copper oxide selective surface by chemical conversion method.
2. Performance testing of solar cooker.
3. Determination of solar constant using pyrheliometer.
4. Measurement of I-V characteristic of solar cell.
5. Study the effect of input light intensity on the performance of solar cell.
6. Study the characteristics of wind.

A.P. STATE COUNCIL OF HIGHER EDUCATION
BA, BCom & BSc Programmes

Revised CBCS w.e.f. 2020-21
SKILL DEVELOPMENT COURSES

SCIENCE STREAM

Syllabus of
ENVIRONMENTAL AUDIT
Total 30 hrs (02h/wk), 02 Credits & Max 50 Marks

Learning Outcomes:

By successful completion of the course, students will be able to;

1. Understand the basic concepts Environmental health
2. Learn and identify the industrial pollution
3. Explain the highlights in the regulatory aspects of Environmental law and policy
4. Understand the various phases of Environmental Audit

UNIT-I

Industrial Pollution and its effects 06h

Climate – Weather and Air Pollution – Classification of water and water bodies – Water Quality Parameters – Water Pollution – Sources –

Classification, nature and Toxicology of water pollutants. – Soil parameters – Soil pollution and impacts – Soil conservation

UNIT-II

Environmental Law & Policy: 09h

Highlights of the Acts, Institutional arrangements for: (1) The Water (Prevention & Control of Pollution) Act, 1974 amended in 1988; (2) The Air (Prevention and Control of Pollution) Act, 1981 amended in 1987; (3) The Water (Prevention and Control of Pollution) Cess Act, 1977 amended in 1991; (4) The Environment (Protection) Act, 1986; (5) The Public Liability Insurance Act, 1991; – Indian Policy Statement for abatement of Pollution, 1992.

UNIT-III

Environmental Audit-Scope & Requisites: 10h

Environmental Audit: Definition; Objectives; Scope, Coverage –

GOI Notification on Environmental Audit –

Benefits to Industry. Reporting Environmental Audit Findings – Importance of Environmental Audit Report to industry, public and the governments.

Co-curricular Activities Suggested:

05h

1. Visit to understand Institutional arrangements and functioning of Pollution Control Boards.
2. Visiting different Ecosystems
3. **Soil analysis:** Determination of soil type and texture, pH, Soil Moisture, Nitrogen, Potassium and Phosphorous.
4. **Water analysis:**
Determination of pH, Dissolved solids and suspended solids, Dissolved Oxygen, COD, BOD.
5. Assignments, Group discussion, Quiz etc.

Reference books and websites:

1. Environmental Education in India by K.R. Gupta
2. Environmental Legislation in India by K.R. Gupta
3. <https://parivesh.nic.in/>
4. <https://www.cpcb.nic.in/>
5. <https://www.free-ebooks.net/environmental-studies-academic>

AP State Council of Higher Education

Revised Syllabus under CBCS Pattern

(w.e.f. 2020-'21 Academic Year)

A Mandatory Course for BA/BCom/BSc etc.

ENVIRONMENTAL EDUCATION

(Total hours of Teaching – 30 Hrs. @ 02 Hrs. per Week)

Course objective: A Generic Course intended to create awareness that the life of human beings is an integral part of environment and to inculcate the skills required to protect environment from all sides.

Learning outcomes: On completion of this course the students will be able to

1. Understand the nature, components of an ecosystem and that humans are an integral part of nature.
2. Realize the importance of environment, the goods and services of a healthy biodiversity, dependence of humans on environment.
3. Evaluate the ways and ill-effects of destruction of environment, population explosion on ecosystems and global problems consequent to anthropogenic activities.
4. Discuss the laws/acts made by government to prevent pollution, to protect biodiversity and environment as a whole.
5. Acquaint with international agreements and national movements, and realize citizen's role in protecting environment and nature.

Unit 1: Environment and Natural Resources

06

Hrs. 1. Multidisciplinary nature of environmental education; scope and importance. **2.** Man as an integral product and part of the Nature.

3. A brief account of land, forest and water resources in India and their importance.

4. Biodiversity: Definition; importance of Biodiversity- ecological, consumptive, productive, social, ethical and moral, aesthetic, and option value.
5. Level of Biodiversity: genetic, species and ecosystem diversity.

Unit-2: Environmental degradation and impacts 10Hrs

1. Human population growth and its impacts on environment; land use change, land degradation, soil erosion and desertification.
2. Use and over-exploitation of surface and ground water, construction of dams, floods, conflict over water (within India).
3. Deforestation: Causes and effects due to expansion of agriculture, firewood, mining, forest fires and building of new habitats.
4. Non-renewable energy resources, their utilization and influences.
5. A brief account of air, water, soil and noise pollution; Biological, industrial and solid waste in urban areas. Human health and economic risks.
6. Greenhouse effect- global warming; ocean acidification, ozone layer depletion, acid rains and impacts on human communities and agriculture.
7. Threats to biodiversity: Natural calamities, habitat destruction and fragmentation, overexploitation, hunting and poaching, introduction of exotic species, pollution, predator and pest control.

Unit 3: Conservation of Environment 10Hrs

1. Concept of sustainability and sustainable development with judicious use of land, water and forest resources; afforestation.
2. Control measures for various types of pollution; use of renewable and alternate sources of energy.
3. Solid waste management: Control measures of urban and industrial waste.
4. Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.
5. Environment Laws: Environment Protection Act; Wildlife Protection Act; Forest Conservation Act.
6. International agreements: Montreal and Kyoto protocols; Environmental movements: Bishnoi of Rajasthan, Chipko, Silent valley.

Suggested activities to learner: (4 hours)

1. Visit to an area to document environmental assets: river/forest/flora/fauna, etc
2. Visit to a local polluted site - Urban/Rural/Industrial/Agricultural site.
3. Study of common plants, insects, birds and basic principles of identification.
4. Study of simple ecosystems - forest, tank, pond, lake, mangroves etc.
5. Case study of a Forest ecosystem or a pond ecosystem.

Suggested textbook:

- Erach Barucha (2004) *Textbook of Environmental Studies for Undergraduate courses* (Prepared for University Grants Commission) Universities Press.
- Purnima Smarath (2018) *Environmental studies* Kalyani Publishers, Ludhiana

Reference books:

- Odum, E.P., Odum, H.T. & Andrews, J. (1971) *Fundamentals of Ecology*. Philadelphia: Saunders.
- Pepper, I.L., Gerba, C.P. & Brusseau, M.L. (2011). *Environmental and Pollution Science*. Academic Press.
- Raven, P.H., Hassenzahl, D.M. & Berg, L.R. (2012) *Environment. 8th edition*. John Wiley & Sons.
- Singh, J.S., Singh, S.P. and Gupta, S.R. (2014) *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi.
- Sengupta, R. (2003) *Ecology and economics: An approach to sustainable development*. OUP.
- Wilson, E.O. (2006) *The Creation: An appeal to save life on earth*. New York: Norton.
- Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll (2006) *Principles of Conservation Biology*. Sunderland: Sinauer Associates,

A.P.STATE COUNCIL OF HIGHER EDUCATION B.
A,B.Com&B.Sc.PROGRAMMES

Revised CBCS w.e.f. 2020-21
SKILL DEVELOPMENT COURSES

Science Stream

Syllabus of
SOLAR ENERGY

Total 30 hrs (02h/wk),

02 Credits & Max Marks: 50

Learning Outcomes:

After successful completion of the course, students will be able to:

1. Acquire knowledge on solar radiation principles with respect to solar energy estimation.
2. Get familiarized with various collecting techniques of solar energy and its storage
3. Learn the solar photovoltaic technology principles and different types of solar cells for energy conversion and different photovoltaic applications.
4. Understand the working principles of several solar appliances like Solar cookers, Solar hot water systems, Solar dryers, Solar Distillation, Solar greenhouses

SYLLABUS:

UNIT-I–Solar Radiation:

(6hrs)

Sun as a source of energy, Solar radiation, Solar radiation at the Earth's surface, Measurement of Solar radiation- Pyro heliometer, Pyranometer, Sunshine recorder, Prediction of available solar radiation, Solar energy-Importance, Storage of solar energy, Solar pond

UNIT-II–Solar Thermal Systems:

(10hrs)

Principle of conversion of solar radiation into heat, Collectors used for solar thermal conversion: Flat plate collectors and Concentrating collectors, Solar Thermal Power Plant, Solar cookers, Solar hot water systems, Solar dryers, Solar Distillation, Solar greenhouses.

UNIT-III–Solar Photovoltaic Systems:

(10hrs) Conversion of Solar energy into Electricity

-Photovoltaic Effect, Solar photovoltaic cell and its working principle, Different types of Solar cells, Series and parallel connections, Photovoltaic applications: Battery chargers, domestic lighting, street lighting and water pumping

Co-curricular Activities (Hands on Exercises): (04hrs)

[Any four of the following may be taken up]

1. Plot sun chart and locate the sun at your location for a given time of the day.
2. Analyse shadow effect on incident solar radiation and find out contributors.
3. Connect solar panels in series & parallel and measure voltage and current.
4. Measure intensity of solar radiation using Pyranometer and radiometers.
5. Construct a solar lantern using Solar PV panel (15W)
6. Assemble solar cooker
7. Designing and constructing photovoltaic system for a domestic house requiring 5kVA power
8. Assignments/Model Exam.

ReferenceBooks:

- 1.SolarEnergyUtilization,G.D.Rai,KhannaPublishers
1. SolarEnergy-Fundamentals,design,modeling&applications,G.N.Tiwari,NarosaPub.,2005.
2. SolarEnergy-Principlesofthermalenergycollection&storage,S.P.Sukhatme,TataMc-GrawHillPublishers,1999.
3. SolarPhotovoltaics-Fundamentals,technologiesandapplications,ChetanSinghSolanki,PHILearningPvt.Ltd.,
4. ScienceandTechnologyofPhotovoltaics,P.JayaramaReddy,BSPublications,2004.

**B.Sc.,Biotechnology: Choice based credit
system B.Sc.,-IVSemester W.E.F.2020-21
BT-401(i)Plant and Animal
Biotechnology**

Course Objectives

The objectives of this course are to introduce students to the principles, practices and application of animal biotechnology, plant tissue culture, plant and animal genomics, genetic transformation.

Unit.I

Plant tissue culture techniques & secondary metabolites production

Plant tissue culture: totipotency, media preparation . nutrients and plant hormones; sterilization techniques; establishment of cultures . callus culture, cell suspension culture , applications of tissue culture- micropropagation; Somatic embryogenesis; synthetic seed production; protoplast culture and somatic hybridization – applications . Cryopreservation , Plant secondary metabolites- concept and their importance

Unit.II

Transgenesis and Molecular markers

Plant transformation technology—Agrobacterium mediated Gene transfer (Ti plasmid), hairy root features of Ri plasmid , Transgenic plants as bioreactors. Herbicide resistance . glyphosphate , Insect resistance- Bt cotton, Molecular markers - RAPD, RFLP and DNA fingerprinting-principles and applications.

Unit.III

Animal tissue culture techniques

Animal cell culture: cell culture media and reagents; culture of mammalian cells, tissues and organs; primary culture, secondary culture, cell lines, stem cell cultures; Tests: cell viability and cytotoxicity, Cryopreservation. Transfection methods (calcium phosphate precipitation, electroporation, Microinjection) and applications.

Unit.IV

Transgenic animals & Gene Therapy

Production of vaccines, diagnostics, hormones and other recombinant DNA products in medicine (insulin, somatostatin, vaccines), IVF, Concept of Gene therapy, Concept of transgenic animals. Merits and demerits- Ethical issues in animal biotechnology

Unit V

Bioethics, Biosafety and IPR

Bioethics in cloning and stem cell research, Human and animal experimentation, animal rights/welfare. Bio safety- introduction to biological safety cabinets; primary containment for biohazards; biosafety levels; GLP, GMP, Introduction to IPR- Types of IPR: patents, trademarks & copyright.

**B.Sc.,Biotechnology:ChoicebasedcreditsystemB.
Sc.,-IVSemester W.E.F.2020-21**

BT-

401(ii)Environmental&IndustrialBiotechnologyLearning Objective

This course aims to introduce fundamentals of Environmental Biotechnology. The course will also give an insight in introducing major groups of microorganisms and their industrial applications

Unit.I

Pollution Types and Control

Environmental Biotechnology-Environmental Pollution: Types of pollution, air pollution & its control through Biotechnology, Bio filters, Bio scrubbers, Bio trickling filter. Water pollution and its management: Measurement of water, pollution, sources of water pollution. Microbiology of wastewater treatment, aerobic processes, activated sludge, oxidation ponds, trickling filters, and rotating biological contactors. Anaerobic processes: Anaerobic digesters, upward flow anaerobic sludge blanket reactors.

UNIT-II

Bioremediation

Biodegradation and Bioremediation. Concepts & principles of Bioremediation, Bioremediation of Hydrocarbons and its applications. Degradation of pesticides and other toxic chemicals by microorganism. Role of genetically Engineered microbes, Concept of Phytoremediation, environmental safety guidelines.

UNIT III

Biofuels

Biofuels- biogas, microbial groups involved in biogas production & interactions, factors affecting biogas production, Biofertilizers, Vermiculture.

Unit IV

Basic principles of Microbial technology

Industrially important microbes, its screening, selection and identification. Maintenance and preservation of industrially important microbial cultures. Strain Improvement, Basic concepts of fermentation; Design of fermenter and applications

Unit V

Commercial Production of Microbial products

Microbial technology products and applications; Microbial production of Organic acids (Lactic acid, citric acid), Amino acids (Glutamic acid, Aspartic acid and Lysine). Fermentation by microbes for food additives: dairy products (Cheese, Yogurt), beverages (Beer, Wine) and antibiotics (Streptomycin, Penicillin) in animal and plant biotechnology and their applications.

Vth SEMESTER PAPERS

**THERE WILL BE THREE PAIRS OF EACH DOMAIN OF
CORE COURSE. STUDENT HAS TO CHOOSE ONE PAIR FROM
EACH DOMAIN.**

A-PAIR

B.Sc MICROBIOLOGY (CBCS) REVISED SYLLABUS-2020

MBTA1-FOOD, AGRICULTURE AND ENVIRONMENTAL MICROBIOLOGY

UNIT-1

No. of Hours: 8

Intrinsic and extrinsic parameters that affect microbial growth in food. Microbial spoilage of food - fruits, vegetables, milk, meat, egg, bread and canned foods. Food intoxication (botulism). Food-borne diseases (salmonellosis) and their detection.

UNIT- II

No. of Hours: 8

Principles of food preservation - Physical and chemical methods. Fermented Dairy foods - cheese and yogurt. Microorganisms as food - SCP, edible mushrooms (white button, oyster and paddy straw). Probiotics and their benefits.

UNIT-III

No. of Hours: 8

Soil Microbiology: Microbial groups in soil, microbial transformations of carbon, nitrogen, phosphorus and Sulphur, Biological nitrogen fixation. Microflora of Rhizosphere and Phyllosphere microflora, microbes in composting. Importance of mycorrhizal inoculums, types of mycorrhizae associated plants, mass inoculums. Production of VAM, field application of Ectomycorrhiza.

UNIT-IV

No. of Hours: 8

Beneficial microorganisms in Agriculture: Biofertilizer (Bacterial, Cyanobacterial and Fungal), microbial insecticides, Microbial agents for control of plant diseases, Biodegradation, Biogas production, Biodegradable plastics, Plant-Microbe interactions. Diseases caused by bacteria and fungi to various commercial and food crops (2 examples each). Management of soil biota for maintaining soil fertility. Conversion of wastelands into fertile lands. Management of soil nutrients.

UNIT-V

No. of Hours: 12

Terrestrial Environment: Soil profile and soil microflora. Aquatic Environment: Microflora of

fresh water and marine habitats. Atmosphere: Aeromicroflora and dispersal of microbes. Extremophiles. Nutrient cycling - Carbon, nitrogen, phosphorus. Methods to detect portability of water samples. Outlines of Solid Waste management: Sources and types of solid waste, Methods of solid waste disposal (composting and sanitary landfill). Liquid waste management: Composition and strength of sewage (BOD and COD), Primary, secondary and tertiary sewage treatment.

B.Sc.,Biotechnology:ChoicebasedcreditsystemB.
Sc.,-IVSemesterW.E.F.2020-21
BT-401(i)PlantandAnimalBiotechnology

CourseObjectives

The objectives of this course are to introduce students to the principles, practices and application of animal biotechnology, plant tissue culture, plant and animal genomics, genetic transformation.

Unit.I

Plant tissue culture techniques & secondary metabolites production

Plant tissue culture: totipotency, media preparation . nutrients and plant hormones; sterilization techniques; establishment of cultures . callus culture, cell suspension culture , applications of tissue culture- micropropagation; Somatic embryogenesis; synthetic seed production; protoplast culture and somatic hybridization – applications . Cryopreservation , Plant secondary metabolites- concept and their importance

Unit.II

Transgenesis and Molecular markers

Plant transformation technology—Agrobacterium mediated Gene transfer (Ti plasmid), hairy root features of Ri plasmid , Transgenic plants as bioreactors. Herbicide resistance . glyphosphate , Insect resistance- Bt cotton, Molecular markers - RAPD, RFLP and DNA fingerprinting-principles and applications.

Unit.III

Animal tissue culture techniques

Animal cell culture: cell culture media and reagents; culture of mammalian cells, tissues and organs; primary culture, secondary culture, cell lines, stem cell cultures; Tests: cell viability and cytotoxicity, Cryopreservation. Transfection methods (calcium phosphate precipitation, electroporation, Microinjection) and applications.

Unit.IV

Transgenic animals & Gene Therapy

Production of vaccines, diagnostics, hormones and other recombinant DNA products in medicine (insulin, somatostatin, vaccines), IVF, Concept of Gene therapy, Concept of transgenic animals. Merits and demerits- Ethical issues in animal biotechnology

Unit V

Bioethics, Biosafety and IPR

Bioethics in cloning and stem cell research, Human and animal experimentation, animal rights/welfare. Bio safety-introduction to biological safety cabinets; primary containment for biohazards; biosafety levels; GLP, GMP, Introduction to IPR-Types of IPR: patents, trademarks & copyright.

**B.Sc.,Biotechnology:ChoicebasedcreditsystemB.
Sc.,-IVSemester W.E.F.2020-21**

BT-

401(ii)Environmental&IndustrialBiotechnologyLearning Objective

This course aims to introduce fundamentals of Environmental Biotechnology. The course will also give an insight in introducing major groups of microorganisms and their industrial applications

Unit.I

Pollution Types and Control

Environmental Biotechnology-Environmental Pollution: Types of pollution, air pollution & its control through Biotechnology, Bio filters, Bio scrubbers, Bio trickling filter. Water pollution and its management: Measurement of water, pollution, sources of water pollution. Microbiology of wastewater treatment, aerobic processes, activated sludge, oxidation ponds, trickling filters, and rotating biological contactors. Anaerobic processes: Anaerobic digesters, upward flow anaerobic sludge blanket reactors.

UNIT-II

Bioremediation

Biodegradation and Bioremediation. Concepts & principles of Bioremediation, Bioremediation of Hydrocarbons and its applications. Degradation of pesticides and other toxic chemicals by microorganism. Role of genetically engineered microbes, Concept of Phytoremediation, environmental safety guidelines.

UNIT III

Biofuels

Biofuels- biogas, microbial groups involved in biogas production & interactions, factors affecting biogas production, Biofertilizers, Vermiculture.

Unit IV

Basic principles of Microbial technology

Industrially important microbes, its screening, selection and identification. Maintenance and preservation of industrially important microbial cultures. Strain Improvement, Basic concepts of fermentation; Design of fermenter and applications

Unit V

Commercial Production of Microbial products

Microbial technology products and applications; Microbial production of Organic acids (Lactic acid, citric acid), Amino acids (Glutamic acid, Aspartic acid and Lysine). Fermentation by microbes for food additives: dairy products (Cheese, Yogurt), beverages (Beer, Wine) and antibiotics (Streptomycin, Penicillin) in animal and plant biotechnology and their applications.

Vth SEMESTER PAPERS

**THERE WILL BE THREE PAIRS OF EACH DOMAIN OF
CORE COURSE. STUDENT HAS TO CHOOSE ONE PAIR FROM
EACH DOMAIN.**

A-PAIR

B.Sc MICROBIOLOGY (CBCS) REVISED SYLLABUS-2020
MBTA1-

FOOD, AGRICULTURE AND ENVIRONMENTAL MICROBIOLOGY

UNIT-1

No. of Hours: 8

Intrinsic and extrinsic parameters that affect microbial growth in food
Microbial spoilage of food - fruits, vegetables, milk, meat, egg, bread and canned foods
Food intoxication (botulism). Food-borne diseases (salmonellosis) and their detection.

UNIT- II

No. of Hours: 8

Principles of food preservation - Physical and chemical methods. Fermented Dairy foods - cheese and yogurt.
Microorganisms as food - SCP, edible mushrooms (white button, oyster and paddy straw). Probiotics and their benefits.

UNIT-III

No. of Hours: 8

Soil Microbiology: Microbial groups in soil, microbial transformations of carbon, nitrogen, phosphorus and sulphur, Biological nitrogen fixation.
Microflora of Rhizosphere and Phyllosphere, microflora, microbes in composting Importance of

mycorrhizal inoculums, types of mycorrhizae associated plants, mass inoculums. Production of VAM, field applications of Ectomycorrhizae and VAM.

UNIT-IV

No. of Hours: 8

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UNIT-V

No. of Hours: 12

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PRINCIPAL
ANDHRA CHRISTIAN COLLEGE
(Day, Evening & P.G.)
GUNTUR