BOARD OF STUDIES

IN

B.Sc BOTANY

2023-2024

DEPARTMENT OF BOTANY

SYLLABUS FOR B.Sc BOTANY Honours

&

B.Sc BOTANY

PITHAPUR RAJAH'S GOVERNMENT COLLEGE

Autonomous and Accredited with 'A' Grade by NAAC (3.17 CGPA)
KAKINADA – 533 001, E G Dist., ANDHRA PRADESH

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
II B.Sc., -Botany-IV/ IV Semester End (W.E.F. 2023-24)
PLANT PHYSIOLOGY AND METABOLISM (COURSE: BO4207)

Total hours of Teaching 60hrs @ 4 hrs/week Total Credits:03

UNIT – 1: PLANT-WATER RELATIONS (10 Hrs)

1. Importance of water to plant life, diffusion, imbibition, osmosis. water potential, osmotic potential, pressure potential.
2. Ascent of sap
3. Transpiration: stomata structure and mechanism of stomatal movements (K+ ion flux).
4. Mechanism of phloem transport; source-sink relationships.

UNIT – II: Mineral Nutrition, Enzymes And Respiration (14 Hrs.)

1. Essential macro and micro mineral nutrients and their role in plants; symptoms of mineral deficiency
2. Absorption of mineral ions; passive and active processes.
3. Characteristics, nomenclature and classification of Enzymes. Mechanism of enzyme action, enzyme kinetics.
4. Respiration: Aerobic and Anaerobic; Glycolysis, Krebs cycle; electron transport system, mechanism of oxidative phosphorylation.

UNIT – III: Photosynthesis and Photorespiration (12 Hrs)

1. Photosynthesis: Photosynthetic pigments; Red drop and Emerson enhancement effect
2. Concept of two photosystems; mechanism of photosynthetic electron transport and evolution of oxygen; photophosphorylation
3. Carbon assimilation pathways (C3,C4 and CAM);
4. Photorespiration - C2 pathway

UNIT – IV: Nitrogen and lipid metabolism (12 Hrs.)

1. Nitrogen metabolism: Biological nitrogen fixation – asymbiotic and symbiotic nitrogen fixing organisms.Structure & Role of Rhizobium bacteria in nodule formation.
2. Lipid metabolism: Classification of Plant lipids, saturated and unsaturated fatty acids.
3. Anabolism of triglycerides, β-oxidation of fatty acids, Glyoxylate cycle.

Unit – V: Plant growth - development and stress physiology (12 Hrs)

1. Growth and Development: Definition, phases and kinetics of growth.
2. Physiological effects of Plant Growth Regulators (PGRs) - auxins, gibberellins, cytokinins, ABA, ethylene.
3. Physiology of flowering:Photoperiodism, role of phytochrome in flowering.
4. Seed germination and senescence; physiological changes.

Text books:

- Botany – IV (Vrukshasastram-II) : Telugu Akademi, Hyderabad
- Pandey, B.P. (2013) College Botany, Volume-III, S. Chand Publishing, New Delhi ¬
- Ghosh, A. K., K. Bhattacharya &G. Hait (2011)
- A Text Book of Botany, VolumeIII, New Central Book Agency Pvt. Ltd.
- , Kolkata Books for Reference: ¬ Aravind Kumar & S.S. Purohit (1998)
- Plant Physiology – Fundamentals and Applications,AgroBotanica,
- Bikaner ¬ Datta, S.C. (2007) Plant Physiology,New Age International (P) Ltd.,
- Publishers, New Delhi ¬ Hans Mohr & P. Schopfer (2006)Plant Physiology, Springer (India) Pvt. Ltd., New Delhi ¬ Hans-Walter heldt (2005) Plant Biochemistry,Academic Press, U.S.A. ¬ Hopkins, W.G. & N.P.A. Huner (2014)Introduction to Plant Physiology,
- Wiley India Pvt. Ltd., New Delhi ¬ Noggle Ray & J. Fritz (2013)Introductory Plant Physiology,
- Prentice Hall (India), New Delhi ¬ Pandey, S.M. &B.K.Sinha (2006)Plant Physiology, Vikas Publishing House, New Delhi ¬ Salisbury, Frank B. & Cleon W. Ross (2007)Plant Physiology,
- Thomsen & Wadsworth, Austalia&U.S.A ¬ Sinha, R.K. (2014) Modern Plant Physiology,
- Narosa Publishing House,New Delhi ¬ Taiz, L.&E. Zeiger (2003)Plant Physiology, Panima Publishers, New Delhi ¬ Verma,
- V.(2007)Text Book of Plant Physiology,Ane Books India, New Delhi

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

II Year B.Sc., Degree Examinations at IV Semester End

Botany Paper IV: PLANT PHYSIOLOGY & METABOLISM

(Course: BO4207 Model Paper w.e.f. 2023-24)

Time: 2Hrs. **Max. Marks: 50**

SECTION – A

3 × 10 =30 M

Answer any **THREE** of the following by choosing atleast one question from each Part., draw neat and labeled diagrams wherever necessary

PART –I

1. Illustrate Transpiration? Describe the mechanism of opening and closing of stomata.
2. Give a detailed note on biological nitrogen fixation in Rhizobium
3. Describe the mechanism of C3 Pathway.

PART – II

4. Give an account on Electron transport system
5. Give a Detailed note on Photoperiodism
6. Give a detailed note on Photorespiration

SECTION – B

4 × 5=20 M

Answer any **FOUR** of the following Questions, Draw neat and labeled diagrams wherever necessary

7. Apoplast and simplest
8. Absorption of mineral ions
9. Red drop effect
10. Difference between C4 and CAM
11. Classification of lipids
12. Vernalisation
13. Brassinosteroids

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

II B.Sc., BOTANY PRACTICAL PAPER – IV PRACTICAL SYLLABUS

PLANT PHYSIOLOGY AND METABOLISM

Total hours of laboratory Exercises 30 hrs @ 2 per week Total credits:02

Suggested Laboratory Exercises:

1. Demonstration of osmosis through Egg Membrane by Thistle Funnel Experiment.
2. Determination of osmotic potential of plant cell sap by plasmolytic method using leaves of *Rhoeo.*
3. Structure of stomata (dicot & monocot)
4. Determination of rate of transpiration using cobalt chloride method
5. Demonstration of ascent of sap/Transpiration pull by using *Impatiens balsamina*.
6. Effect of Temperature on membrane permeability by colorimetric method.
7. Study of mineral deficiency symptoms using plant material/photographs.
8. Separation of chloroplast pigments using paper chromatography technique.
9. Rate of photosynthesis under varying Co_2 concentrations.
10. Effect of light intensity on oxygen evolution in photosynthesis using Wilmott' bubbler
11. Respiration – Aerobic/Anaerobic.
12. Difference between C3 and C4 Plants by leaf Anatomy.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

II B.Sc., Botany Practical Examinations at the End of Semester-IV

(PLANT PHYSIOLOGY AND METABOLISM)

Botany Practical Model Paper-IV (w.e.f 2023-24)

Time: 2 hours **Max. Marks: 50**

---

1. Experiment '**A**' Major experiment from Plant-Water relations / Plant metabolism **15M**

Scheme of valuation:

Aim, Principle and Procedure	-	5M
Conduct of Experiment	-	6M
Report of result and inference	-	4M

2. Experiment 'B' Minor Experiment **7M**

Scheme of valuation:

Aim, Principle and Procedure	-	5M
Report of result and inference	-	2M

3. Scientific observation and data analysis 4×5=**20M**

D. Plant-Water relations
E. Mineral nutrition and Enzymes
F. Plant metabolism
G. Plant growth and development

Scheme of valuation:

Identification	-	1M
Diagram	-	1M
Reasons/analysis	-	1M

4. Record & Viva-voce 5+3=**08M**

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
II B.Sc., -Botany-V/ IV Semester End (W.E.F. 2023-24)
Plant Physiology & Metabolism
Mapping as per Blooms Taxonomy

S. NO	Subject	Semester	Title of the course (Paper)	Topic	Parameters as per Blooms Taxonomy (knowledge/ Application / Creativity/ Innovation)	Experiential learning component	Scope (skill/ employability/entrepreneurship)
1	Botany	V	Plant Physiology & Metabolism	Plant – Water relations	Knowledge	Lecture	Skill
2	Botany	V	Plant Physiology & Metabolism	Mineral nutrition, Enzymes And Respiration	Knowledge	Shall be show by Photograph	Skill
3	Botany	V	Plant Physiology & Metabolism	Photosynthesis & Photorespiration	Knowledge	Shall be shown by Photographs & Models	Skill
4	Botany	V	Plant Physiology & Metabolism	Nitrogen and lipid metabolism	Knowledge	lecture	Skill
5	Botany	V	Plant Physiology & Metabolism	Plant growth – development and stress physiology	Knowledge	Lecture5	Skill

CO-PO Mapping

	Pithapur Rajah's Government College (Autonomous) Kakinada	Program & Semester II B.Sc. (IV Semester)			
Course4	**TITLE OF THE COURSE** **Plant Physiology & Metabolism**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites:		3	1	-	3

CourseOutcomes:

On Completion of the course, the students will be able to-	
CO1	Understand the role of water in plant life
CO2	Aquire knowledge on various deficiency diseases
CO3	Understand the system of photosynthesis in plants
CO4	Knowledge on plant metabolism
CO5	Knowledge on different factors responsible for stress in Plants

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	2	2	1	2	3	3	3	3	3
CO2	1	2	2	2	3	3	2	3	3	3
CO3	1	3	2	2	3	3	2	3	3	3
CO4	1	2	2	2	3	3	3	3	3	3
CO5	1	2	2	2	3	3	3	3	3	3

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

II B.Sc., -Botany- IV Semester End (W.E.F. 2023-24)
CELL BIOLOGY, GENETICS AND PLANT BREEDING

Total hours of Teaching 40hrs @ 3 hrs/week Total Credits:03

Learning outcomes: On successful completion of this course, the student will be able to:

- Distinguish prokaryotic and eukaryotic cells and design the model of a cell.
- Explain the organization of a eukaryotic chromosome and the structure of genetic material.
- Demonstrate techniques to observe the cell and its components under a microscope.
- Discuss the basics of Mendelian genetics, its variations and interpret of characters.
- Elucidate the role of extra-chromosomal genetic material for inhrtitance of characters.
- Evaluate the structure and functions, regulation of genetic material.
- Understand the application of principles and modern techniques in plant breeding
- Explain the procedures of selection and hybridization for improvement of crops.

UNIT – I: THE CELL (12h)

1. Cell theory; prokaryotic vs eukaryotic cell; animal vs plant cell; a brief account on ultra structure of a plant cell.
2. Ultra structure of cell wall
3. Ultra structure of Plasma membrane and various theories on its organization
4. Polymorphic cell organelles (Plastids); ultra structure of chloroplast. Plastid DNA.

UNIT – II: CHROMOSOMES (12h)

1. Prokaryotic vs Eukaryotic chromosomes. Morphology of a eukaryotic chromosomes.
2. Euchromatin and Heterochromatin; Karyotype and ideogram
3. Brief account of chromosomal aberrations – structural and numerical changes.
4. Organization of DNA in a chromosome (Solenoid and Nucleosome models)
5. Special types of chromosomes – Polythene, Lampbrush, β chromosomes.

UNIT – III: MENDELIAN AND NON-MENDELIAN GENETICS (12h)

1. Mendel's laws of Inheritance. Incomplete dominance and co-dominance; Multiple allelism.
2. Complementary, supplementary and duplicating gene interactions (Plant based examples are to be dealt).
3. A brief account on linkage and crossing over; Chromosomal mapping-2 point test cross and 3

point test cross.

4. Concept of maternal inheritance (Corren's experiment on Mirabilis jalapa); Mitochondrial DNA

UNIT – IV: STRUCTURE AND FUNCTIONS OF DNA (12h)

1. Watson and crick model of DNA. Brief account on DNA replication (Semi conservative method).
2. Brief account on Transcription,types and functions of RNA. Gene concept and genetic code translation.
3. Regulation of gene expression in prokaryotes – Lac operon

UNIT – V:Plant Breeding (12h)

1. Plant Breeding and its scope; Genetics basis for plant breeding.Plant introduction and acclimatization.
2. Definition, Procedure; applications and uses; advantages and limitations of : (a) Mass selection, (b) Pure line selection and (c) Clonal selection.
3. Hybridization – scheme, and technique; Heterosis(hybrid vigour).
4. Brief account on Molecular breeding – DNA markers in plant breeding. RAPD, RFLP.

Suggested activity: Seminar, Debate, Quiz, observation of live cells and nucleus in Onion peels, observation of Meiotic nuclei in Maize pollen. Solving Genetics problems.

TEXT BOOKS :

1. Botany – III (Vrukshasastram-I) : Telugu Akademi, Hyderabad
2. Pandey, B.P. (2013) *College Botany, Volume-III*, S. Chand Publishing, New Delhi
3. Ghosh, A.K., K.Bhattacharya&G. Hait (2011) *A Text Book of Botany, Volume-III*, New CentralBook Agency Pvt. Ltd., Kolkata
4. Chaudhary, R. C. (1996) *Introduction to Plant Breeding*, Oxford & IBH Publishing Co. Pvt. Ltd.,New Delhi

REFERENCE BOOKS:

1. S. C. Rastogi (2008)*Cell Biology*,New Age International (P) Ltd. Publishers, New Delhi
2. P. K. Gupta (2002)*Cell and Molecular biology*,Rastogi Publications, New Delhi
3. B. D. Singh (2008) *Genetics*,Kalyani Publishers, Ludhiana
4. A.V.S.S. Sambamurty (2007) *Molecular Genetics*,Narosa Publishing House,New Delhi
5. Cooper, G.M. & R.E. Hausman (2009)*The Cell – A Molecular Approach*, A.S.M. Press,Washington
6. Becker, W.M., L.J. Kleinsmith& J. Hardin (2007)*The World of Cell*, Pearson Education, Inc., NewYork
7. De Robertis, E.D.P. & E.M.F. De Robertis Jr. (2002)*Cell and*

Molecular Biology, LippincottWilliams & Wilkins Publ., Philadelphia

8. Robert H. Tamarin (2002)*Principles of Genetics,*Tata McGraw –Hill Publishing Company Limited,New Delhi.
9. Gardner, E.J., M. J. Simmons & D.P. Snustad (2004)*Principles of Genetics,* John Wiley & SonsInc., New York
10. Micklos, D.A., G.A. Freyer& D.A. Cotty (2005) *DNA Science: A First Course,* I.K. InternationalPvt. Ltd., New Delhi
11. Chaudhari, H.K.(1983)*Elementary Principles of Plant Breeding*, TMHpublishers Co., New Delhi
12. Sharma, J.R. (1994)*Principles and Practice of Plant Breeding*, Tata McGraw- Hill Publishers, NewDelhi
13. Singh,B.D. (2001)*Plant Breeding : Principles and Methods* ,Kalyani Publishers, Ludhiana
14. Pundhan Singh (2015) *Plant Breeding for Undergraduate*
15. upta, S.K. (2010)*Plant Breeding : Theory and Techniques,*

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

III Year B.Sc., Degree Examinations at V Semester End

Botany Paper V: CELL BIOLOGY GENETICS AND PLANT BREEDING

(Course: BO5207 Model Paper w.e.f. 2023-24)

Time: 2Hrs. **Max. Marks: 50**

SECTION – A 3×10 =30M

Answer any **THREE** of the following by choosing atleast one question from each Part., draw neat and labeled diagrams wherever necessary.

PART – I

1. Give an account on Ultra structure and functions of cell membrane
2. Give a note on Replication of DNA especially Semiconservative model
3. Linkage concept and significance

PART – II

4. write about Methods of crop improvement
5. Explain the Role of Soma clonal variations
6. Describe the ultra structure and functions of cell wall

SECTION – B 4×5=20M

Answer any **FOUR** of the following Questions, Draw neat and labeled diagrams wherever necessary.

7.Difference between Prokaryotic and Eukaryotic cell

8.Euchromatin, Heterochromatin

9.m-RNA Structure and Functions

10.Test Cross

11.Selection in Plant breeding

12.RFLP

13.Hybridization in Plant breeding

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
II B.Sc., BOTANY PRACTICAL PAPER – V PRACTICAL SYLLABUS

CELL BIOLOGY, GENETICS AND PLANT BREEDING

Total hours of laboratory Exercises 45 hrs @ 2hrs/week Total credits:02

Course outcomes: After successful completion of this practical course the student will be able to:

- Show the understading of techniques of demonstration Mitosis and meiosis in the laboratory and identify different stages of cell division.
- Identify and explain with diagram the cellular parts of a cell from a model or picture and prepare models.
- Solve the problems related to crosses and gene interactions.
- Demonstration plant breeding techniques such as emasculation and bagging.

PAPER – V PRACTICAL SYLLABUS

Suggested Laboratory Exercises:

1. Study of the structure of cell organelles through photomicrographs.
2. Study of structure of plant cell through temporary mounts.
3. Study of various stages of mitosis using cytological preparation of Onion root tips.
4. Study of effect of organic solvent on permeability of cell membrane.
5. Numerical problems solving Mendel' Laws of inheritance
6. Chromosome mapping using 3-point test cross data.
7. Hybridization techniques – emasculation, bagging (for demonstration only).
8. Field visit to a plant breeding research station.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

II B.Sc., Botany Practical Examinations at the End of Semester-IV

(CELL BIOLOGY, GENETICS AND PLANT BREEDING)

Botany Practical Model Paper-V (w.e.f 2023-24)

Time: 2 hours **Max. Marks: 50**

1. Make a cytological preparation of given material 'A' (mitosis or meiosis in Onion) by squashtechnique, report any two stages, draw labeled diagrams and write the reasons. 15 M
2. Solve the given Genetic problem (Dihybrid cross/ Interaction of genes/ 3-point test cross) 'B'and write the conclusions. 15 M
3. Identify the following and justify with apt reasons. 3 x 4 = 12 M
   A. Cell Biology (Cell organelle)

   B. Genetics (DNA/RNA)

   C. Plant Breeding
4. Record + Viva-voce 5 + 3 = 8 M

Suggested co-curricular activities for Botany Core Course- 5 in Semester-IV :

A. Measurable :

a. Student seminars :

1. Light microscopy : bright field and dark field microscopy.
2. Scanning Electron Microscopy (SEM).
3. Transmission Electron Microscopy (TEM).
4. Mitosis and Meiosis
5. Cell cycle and its regulation.
6. Cell organelles bounded by single membrane.
7. Prokaryotic chromosomes
8. Special types of chromosomes :Polytene, Lampbrush and B-chromosomes.
9. Different forms of DNA.
10. Gene mutations.
11. DNA damage and repair mechanisms.
12. Reverse transcription.
13. Protein structure.
14. Modes of reproduction in plants.
15. Modes of pollination in plants

b. Student Study Projects :

1. Study of mitoticcell cycle in roots of*Aliumcepa*
2. tudy of mitoticcell cycle in roots of*Aloe vera*
3. Observation of chromosomal aberrations in *Allium cepa* root cells exposed toindustrialeffluent(s).
4. Observation of chromosomal aberrations in *Allium cepa* root cells exposed toheavymetal(s).
5. Observation of polyembryony in *Citrus* spp.and *Mangiferaindica.*

c. Assignments: Written assignment at home / during '0' hour at college; preparation of chartswith drawings, making models etc., on topics

included in syllabus.

B. General :

- Field visit to Agriculture/Horticulture University/ Research station to observe Plant breeding methods.
- Group Discussion (GD)/ Quiz/ Just A Minute (JAM) on different modules in syllabus of the course.

RECOMMENDED ASSESSMENT OF STUDENTS:

Recommended continuous assessment methods for all courses:

Some of the following suggested assessment methodologies could be adopted. Formal assessment for awarding marks for Internal Assessment in theory.

(a) Formal:

1. The oral and written examinations (Scheduled and surprise tests),
2. Simple, medium and Critical Assignments and Problem-solving exercises,
3. Practical assignments and laboratory reports,
4. Assessment of practical skills,
5. Individual and group project reports,
6. Seminar presentations,
7. Viva voce interviews.

(b) Informal:

1. Computerized adaptive testing, literature surveys and evaluations,
2. Peers and self-assessment, outputs form individual and collaborative work
3. Closed-book and open-book tests,

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
II B.Sc., -Botany-V/ IV Semester End (W.E.F. 2023-24)
Cell Biology, Genetics & Plant Breeding
Mapping as per Blooms Taxonomy

S. NO	Subject	Semester	Title of the course (Paper)	Topic	Parameters as per Blooms Taxonomy (knowledge/ Application / Creativity/ Innovation)	Experiential learning component	Scope (skill/ employability/entrepreneurship)
1	Botany	V	Cell Biology, Genetics & Plant Breeding	Cell Biology	Knowledge	Shall be shown by microscope & models	Skill
2	Botany	V	Cell Biology, Genetics & Plant Breeding	Genetic Material	Knowledge	Shall be shown by microscope & Photographs	Skill
3	Botany	V	Cell Biology, Genetics & Plant Breeding	Mendelian Inheritance	Knowledge	Problem Solving	Skill
4	Botany	V	Cell Biology, Genetics & Plant Breeding	Plant Breeding	Knowledge	Visiting Plant Breeding Station	Skill
5	Botany	V	Cell Biology, Genetics & Plant Breeding	Breeding, Crop Improvement and Biotechnology	Knowledge	Visiting Plant Breeding Station	Skill

CO-PO Mapping

	Pithapur Rajah's Government College (Autonomous) Kakinada	Program & Semester II B.Sc. (IV Semester)			
Course5	**TITLE OF THE COURSE Cell Biology, Genetics & Plant Breeding**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites:		3	1	-	3

CourseOutcomes:

On Completion of the course, the students will be able to-	
CO1	Distinguish prokaryotic and eukaryotic cells and design the model of a cell.
CO2	Explain the organization of a eukaryotic chromosome and the structure of genetic material.
CO3	Demonstrate techniques to observe the cell and its components under a microscope
CO4	Discuss the basics of Mendelian genetics, its variations and interpret of characters.
CO5	Elucidate the role of extra-chromosomal genetic material for inhertitance of characters.

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	2	2	1	2	3	3	3	3	3
CO2	1	2	2	2	3	3	2	3	3	3
CO3	1	3	2	2	3	3	2	3	3	3
CO4	1	2	2	2	3	3	3	3	3	3
CO5	1	2	2	2	3	3	3	3	3	3

ENVIRONMENTAL EDUCATION

Under life skill course in IV semester

(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 fromall 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 andNatural 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 waterresources in India and their importance.
4. Biodiversity : Definition; importance of Biodiversity - ecological,consumptive, productive, social, ethical and moral, aesthetic, and option value.
5. Levels 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, conflicts 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 pollutions; Biological, industrial and solid wastes in urban areas. Human health and economic risks.
6. Green house 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, over exploitation, hunting and poaching, introduction of exotic species, pollution, predator and pest control.

Unit 3: Conservation of Environment 10 Hrs

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; Act; Wildlife Protection Act; Forest Conservation Act.
6. International agreements: Montreal and Kyoto protocols; Environmental movements: Bishnois 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 text book :

- ErachBarucha (2004) *Text book of Environmental Studies for Undergraduate courses* (Prepared for University Grants Commmission) Universities Press.
- PurnimaSmarath (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,

Model question paper for theory examination at the end of IV Semester

Life Skill Course

ENVIRONMENTAL SCIENCE

Max. Time : 2 Hrs. **Max. Marks: 50**

Max. Marks: 50 Time: 1 1/2 hrs (90 Minutes)

Section -A (Total: 4x5=20 Marks)

(Answer any **four questions**. Each answer carries **5 marks**

(Total 8 questions. At least 1 question should be given from each Unit)

1.
2.
3.
4.
5.
6.
7.
8.

Section- B (Total: 3x10 = 30 Marks)

(Answer any **three questions**. Each answer carries **10 marks**

(Total five questions. At least 1 question should be given from each Unit)

1.
2.
3.
4.
5.

Note: Questions may be set in such a way to test the outcomes instead of recalling of information.
