Darrang College (Autonomous), Tezpur-784001

Syllabus for FYUGP MDC Science

Approved by :

Academic Council vide Resolution no. 02, dated- 29-12-2025

NEP-FYUGP COURSE DISTRIBUTION FOR THE MULTIDISCIPLINARY COURSES (MDC) IN LIFE SCIENCES

Semester	Course Name: MDC IN LIFE SCIENCES	Code	Credit
1	**Paper Name: Basics in Life Sciences** **Total Marks: 75** • Theory: 45 • Projects/industry visits/ fieldwork :20 • Internal Assessment: 10	**MDC-01033**	**3**
2	**Paper Name: Sustainable Development** **Total Marks: 75** • Theory: 45 • Projects/industry visits/ fieldwork :20 • Internal Assessment: 10	**MDC-02033**	**3**
3	**Paper Name: Bioresources and Traditional Knowledge** **Total Marks: 75** • Theory: 45 • Projects/industry visits/ fieldwork :20 • Internal Assessment: 10	**MDC-03033**	**3**

General Introduction:

The Multidisciplinary Courses (MDC) in Life Sciences under the Four-Year Undergraduate Programme aim to provide fundamental scientific understanding along with societal relevance, environmental awareness and skills for sustainable living. The three papers – **Basics in Life Sciences**, **Sustainable Development** and **Bioresources and Traditional Knowledge** – together give a holistic exposure to the biological world, human–nature relationships, conservation practices, and responsible utilization of natural resources.

These courses introduce students to the diversity of life, the functioning of ecosystems, the role of biotechnology, and contemporary issues such as climate change, sustainable resource management and indigenous knowledge systems. By integrating scientific knowledge with social context, the MDC curriculum encourages environmental ethics, critical thinking, problem solving, and community-based learning so that learners develop informed attitudes required for a rapidly changing world.

Programme Outcomes (POs) (MDC in Life Sciences)

After completing the Multidisciplinary Courses in Life Sciences, students will be able to:

1. **Demonstrate basic scientific literacy** in biological sciences and relate scientific concepts to real-world issues.
2. **Understand and appreciate biodiversity**, ecosystem functioning and the importance of conserving natural resources.
3. **Apply principles of sustainable development** in daily life and participate in eco-friendly practices at personal and community level.
4. **Recognize the socio-cultural importance of bioresources and traditional knowledge**, particularly in the context of India and North-East India.
5. **Analyse environmental problems and propose sustainable solutions** using scientific reasoning.
6. **Develop awareness on climate change, pollution, and ecological degradation**, and understand national and global initiatives addressing these concerns.
7. **Integrate indigenous knowledge and modern science** for conservation, livelihood improvement and resource management.
8. **Develop values of environmental responsibility and ethical use of resources** in alignment with SDGs and national priorities.

Assessment Methods

Student progress will be continuously evaluated through a combination of formative and summative assessment techniques, including:

- Home assignments
- Reports based on projects, industry visits, or fieldwork
- In-semester/Sessional examinations (theory)
- End-semester examinations (theory)

COURSE OUTCOMES (COs) – applicable to all the Three MDC Papers

Upon completion of these MDC papers, learners will be able to:

1. Explain fundamental concepts of life sciences, biodiversity, ecology and bioresources.
2. Discuss issues related to environmental degradation and suggest sustainable practices.
3. Identify important bioresources of India and recognise their cultural and economic importance.
4. Describe traditional knowledge systems and their relevance in modern conservation practices and bioprospecting.
5. Examine the importance of sustainability, climate responsibility and renewable resources in societal development.
6. Understand government policies, national initiatives and global agreements related to conservation and sustainable development.
7. Apply scientific concepts, community knowledge and practical skills for improving livelihood options and environmental stewardship.

FYUGP 1st Semester Multidisciplinary Course in Life Sciences
Detailed Syllabus of 1st Semester

Title of the Paper: **MDC-I/ Basics in Life Sciences**

Paper Code: MDC-01033

Total Credits =3

Unit	Content	Contact Hour	Marks
Unit 1	**Basics of Plant Sciences**: - General features of Bacteria, Viruses, Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms; - Elements of Economic Botany, integrated disease management; - Importance of Agriculture in National Economy.	6	10
Unit 2	**Basics of Anthropology:** - Mechanism of evolution of life, Fossil evidence of Human Evolution, Mans Place in the Animal Kingdom - Racial criteria, Major races, Racial classification, Racial elements in India	6	10
Unit 3	**Basics in Economic Zoology:** - Basic principles of Aquaculture, prospects and challenges of Aquaculture in North Eastern states, Induced breeding, Composite fish farming - Sericulture: Definition, classification of silkworm-Eri, Muga, Pat, Tasar; Food plants of Muga and Eri Silkworm; Nature and Use of Silk, Scope of Sericulture in Northeast Region of India - Introduction to Apiculture – Definition and scope, Diversity of economically important honeybees in Northeast India (Major species), Caste distinction in Honey bee, Division of Labour, Importance of Honey; Artificial bee rearing	8	15
Unit 4	**Application of life sciences:** - Definition of Biotechnology, concept of Gene - Application of biotechnology in medicine, agriculture, environment, food and industry; - Gene manipulation, Gene cloning	6	10

Unit-wise Learning Objectives

Unit 1: Basics of Plant Sciences

After completing this unit, learners will be able to:

1. Describe the general characteristics of major plant groups from lower to higher forms.
2. Explain the economic importance of plants and their products.
3. Understand the basic concept of Integrated Disease Management (IDM).
4. Recognize the importance of agriculture in the national economy.

Unit 2: Basics of Anthropology

After completing this unit, learners will be able to:

1. Understand the evolutionary process and fossil evidence related to human evolution.
2. Explain man's systematic position in the animal kingdom.
3. Describe racial criteria and major racial classification.
4. Identify racial elements present in India and their anthropological significance.

Unit 3: Basics in Economic Zoology

After completing this unit, learners will be able to:

1. Describe basic principles of aquaculture and its prospects in Northeast India.
2. Understand different induced breeding and integrated aquaculture systems.
3. Explain the classification of commercially important silkworms of Northeast India and their economic use.
4. Recognize the importance of honeybees, their caste system, and the role of division of labour in bee colonies.
5. Understand artificial bee rearing using Newton and Langstroth boxes.

Unit 4: Application of Life Sciences

After completing this unit, learners will be able to:

1. Define biotechnology and basic concepts of genes.
2. Explain the application of biotechnology in agriculture, medicine, environment, food and industries.
3. Understand the principles of gene manipulation and gene cloning.

Particulars of Course Designer:

1. Rajashree Bordoloi, Assistant Professor, Department of Botany
2. Dr. Barsha Borgohain, Assistant Professor, Department of Physics

Suggested Reading:

- Jaiswal, K., et al. (2014). *Economic Zoology: Apiculture, Sericulture and Aquaculture.* Narendra Publishing House, ISBN: 978-93-82471-41-7
- Rathoure, A.K. (2020). *Applied and Economic Zoology*. Daya Publishing House, ISBN: 978-93-5124-646-6
- Pandiyan, M. (2024). *Introduction to Agricultural Botany*. Scientific Publishers, ISBN: 978-93-89832-80-8, e-ISBN: 978-93-89832-81-5
- Singh, B.K. (2018). *Textbook of Botany*.S. Chand, ISBN: 978-93-5280-523-5
- Verma, P.S. & Agarwal, V.K. (2019). *Cell Biology, Genetics, Molecular Biology*. S. Chand, ISBN: 978-93-86212-62-9
- Starr, C. & Taggart, R. (2019). *Biology: The Unity and Diversity of Life.* Cengage Learning, ISBN: 978-1337408332
- Raven, P.H., Evert, R.F., & Eichhorn, S.E. (2013). *Biology of Plants.* W.H. Freeman / Macmillan, ISBN: 978-1429219617
- Tortora, G.J.; Funke, B.; Case, C. (2018). *Microbiology: An Introduction*. Pearson ISBN: 978-0134605187
- Madigan, M., Bender, K., et al. (2019). *Brock Biology of Microorganisms*. Pearson ISBN: 978-0134800469
- Jurmain, R., Kilgore, L., & Trevathan W. (2012). *Introduction to Physical Anthropology*. Cengage, ISBN: 978-0840030417
- Brown, T.A. (2016). *Gene Cloning and DNA Analysis.* Wiley-Blackwell, ISBN: 978-1119072560

FYUGP 2nd Semester Multidisciplinary Course in Life Sciences
Detailed Syllabus of 2nd Semester

Title of the Paper: **MDC-II/ Sustainable Development**

Paper Code: MDC-02033

Total Credits =3

Unit	Content	Contact Hour	Marks
Unit 1	**Introduction to Sustainable Development** • Meaning, concept, definition, components and scope • Ecology and environmental conservation, Major drivers of Biodiversity change and ecological imbalance • The role of higher education in sustainable development • Millennium Development Goals, Sustainable Development Goals, UNFCCC, COP, IPCC	12	12
Unit 2	**Sustainable Production and Resource Utilization** • Challenges to sustainable development • Sustainable agriculture and forestry, Precision farming – concept and importance, Application of Artificial Intelligence in precision farming • Sustainable utilization of water, mineral, soil and forest resources, Waste–to–Wealth concept – definition, scope and relevance • Bioconversion of organic waste: vermicomposting, biochar, biogas, biodiesel	12	12
Unit 3	**Policies and Programmes for Sustainable Development** • National and international initiatives for sustainable development, Montreal Protocol, Kyoto Protocol, Paris Agreement, Rio Earth Summit (1992) and Agenda–21 • NITI Aayog and Sustainable Development • National Environment Policy, Swachh Bharat Mission • National Solar Mission	10	8
Unit 4	**Green Chemistry for Sustainable Development** • Green chemistry – definition, scope and need, Ttwelve principles of green chemistry; Concept of designing a Green Synthesis using these principles, Prevention of Waste/ byproducts; maximum incorporation of the materials used in chemical process (Atom Economy) • Toxicity of chemical by-products (Chemical accidents- Bhopal Gas Tragedy and Chernobyl Disaster), prevention/	10	8

	minimization of hazardous/ toxic byproducts; • Examples of environment friendly chemical processes, green reagents, green solvents, solventless processes. • Green chemistry-based industries: basic concept		
Unit 5	**Energy Resources and Sustainable Development** • Renewable and non-renewable energy resources • Key issues and challenges • Need for alternative sustainable energy sources • Applications of solar, hydro and wave energy	6	5

Unit-wise Learning Objectives

Unit 1: **Introduction to Sustainable Development:** After completion of this unit, learners will be able to:

1. Explain the basic concept of sustainable development, Describe international frameworks including MDGs and SDGs.
2. Appreciate the relevance of UNFCCC and COP mechanisms.

Unit 2 : **Sustainable Production and Resource Utilization:** After completion of this unit, learners will be able to:

1. Identify key challenges to sustainability in the present context.
2. Explain sustainable agriculture and forestry practices.
3. Understand precision farming and the role of Artificial Intelligence.
4. Describe bioconversion technologies within the Waste–to–Wealth framework.

Unit 3 : **Policies and Programmes for Sustainable Development :** After completion of this unit, learners will be able to:

1. Recognize major international environmental agreements.
2. Understand policy initiatives for sustainable development in India.
3. Discuss national missions such as Swachh Bharat and Solar Mission.

Unit 4 : **Green Chemistry for Sustainable Development:** After completion of this unit, learners will be able to:

1. Comprehend the principles of green chemistry.
2. Understand the impacts of chemical disasters on environment and health.
3. Identify sustainable chemical approaches and emerging green industries.

Unit 5: **Energy Resources and Sustainable Development:** After completion of this unit, learners will be able to:

1. Distinguish renewable and non-renewable energy resources.
2. Explain the need for alternative energy systems.
3. Discuss key applications of solar, hydro and wave energy.

Particulars of Course Designer:

1. Dr Rabindra Hazarika, Associate Professor, Department of Zoology
2. Dr. Kashmiri Neog, Assistant Professor, Department of Chemistry

Suggested Readings

- Arjun, G., Sarkar A., et al. (2019). *Environmental Issues & Sustainable Development.* Notion Press India. ISBN: 9781643246861
- Ahlawat, A. (2019). *Sustainable Development Goals.* Notion India Press. ISBN: 9789388363556
- Mishra, J. (2018). *Growth with Sustainability.* Notion Press. ISBN: 9789352819133

- Ossewaarde, M. (2018). *Introduction to Sustainable Development.* Sage Publications. ISBN: 9781472474533
- Anastas, P. & Warner, J. (1998/2000). *Green Chemistry: Theory and Practice.* Oxford University Press. ISBN: 9780198506980
- Boyle, G. (2012). *Renewable Energy: Power for a Sustainable Future.* Oxford University Press. ISBN: 9780199545339
- Molden, D. (ed.) (2013). *Water for Food, Water for Life.* Earthscan. ISBN: 9781844073962

FYUGP 3rd Semester Multidisciplinary Course in Life Sciences
Detailed Syllabus of 3rd Semester

Title of the Paper: **MDC-III/ Bioresources and Traditional Knowledge**

Paper Code: MDC-03033

Total Credits =3

Unit	Content	Contact Hour	Marks
Unit 1	**Biodiversity** • Definition and levels of biodiversity (genetic, species and ecosystem), Biodiversity hotspots • Biodiversity of North-East India • Valuing biodiversity – direct and indirect use values • Role of Remote Sensing (RS) and Geographical Information System (GIS) in biodiversity studies	9	10
Unit 2	**Conservation Practices** • International initiatives for biodiversity conservation • In-situ and Ex-situ conservation, Biological Diversity Act • National Biodiversity Action Plan (brief account) • Wildlife sanctuaries and protected areas • Wetlands and Ramsar Sites, Mangrove ecosystems • Role of biotechnology in biodiversity conservation	9	10
Unit 3	**Bioresources** • Distribution, parts used and method of utilization, nutritive value and food supplements (Plants of NE India: Bora rice, Bamboo shoot, *Dhekia sak*, Masundari) • Endemic fishes of Assam (carps, minnows, murrels, eels, catfishes, perches, trouts) • Social insects – honey bees and their importance • Indigenous beverages (apong, judima, jumai, sulai) • Wild edible plants, wild fruits, and wild medicinal plants	9	10
Unit 4	**Traditional Knowledge** • Cuisine diversity, Food ethno-zoology and ethno-botany, ethno-medicine • Traditional Food processing and preservation techniques, Fermented foods and beverages, Role of traditional knowledge in bioprospecting • Traditional Knowledge Digital Library (TKDL) – concept and significance, ITK in biodiversity conservation	10	8

Unit-wise Learning Objectives

Unit 1

After completion of this unit, learners will be able to:

1. Define biodiversity and understand its major levels.
2. Recognise biodiversity hotspots with special emphasis on North-East India.
3. Explain the value and importance of biodiversity in human society.
4. Understand applications of RS and GIS in biodiversity assessment.

Unit 2

After completion of this unit, learners will be able to:

1. Discuss global and national conservation approaches.
2. Differentiate between in-situ and ex-situ conservation strategies.
3. Describe major legal and policy frameworks for biodiversity protection in India.
4. Understand the role of biotechnology in modern conservation.

Unit 3

After completion of this unit, learners will be able to:

1. Identify major bioresources and their parts used.
2. Recognise nutritionally important wild edible plants and food resources.
3. Understand the biodiversity of fishes and useful insects of North-East India.
4. Appreciate the importance of indigenous food and beverages.

Unit 4

After completion of this unit, learners will be able to:

1. Describe traditional knowledge associated with food, cuisine and medicine.
2. Understand the role of local knowledge systems in conservation and livelihood.
3. Explain the concept of bioprospecting and issues of biopiracy.
4. Appreciate the role of TKDL and ITK in biodiversity management and resource harvesting.

Particulars of Course Designer:

1. Dr. Lakshmi Roy, Associate Professor, Department of Geography
2. Dr. Manika Das Kataki, Assistant Professor, Department of Biotechnology

Suggested Reading

1. Jain, S.K. (2000). *Manual of Ethnobotany.* Scientific Publishers India. ISBN: 9788172332903
2. Singh, K.P. & Singh, J.S. (2011). *Ecology, Environment and Sustainable Development.* Discovery Publishing. ISBN: 9788171413436
3. Puri, R.K. (2017). *Ethnobotany of India.* CRC Press India. ISBN: 9781498747072
4. Groombridge, B. & Jenkins, M. (2002). *World Atlas of Biodiversity.* University of California Press. ISBN: 9780520236689
5. Colfer, C.J.P. (2005). *Indigenous People and Conservation.* Earthscan. ISBN: 9781844070077
6. Cunningham, A.B. (2001). *Applied Ethnobotany.* Earthscan. ISBN: 9781853836978
7. Barton, H. & Flannery, K. (2020). *Biocultural Diversity in Global Context.* Cambridge University Press. ISBN: 9781108481134
