THE ASSAM
ROYAL GLOBAL UNIVERSITY
GUWAHATI

# Royal School of Life Sciences (RSLSC)

## Department Of Forestry

## Course Structure & Syllabus
## (Based on NEP-2020)

B.Sc. Forestry
(4-years Single Major)

W.E.F.
AY-2024-25

**STRUCTURE OF THE SYLLABUS FOR 4 YEAR UG PROGRAMME**

**SCHOOL NAME -RSLSC**

**DEPARTMENT NAME -Forestry**

**PROGRAMME NAME -B.Sc. Forestry**

| **1st SEMESTER** | | | | | |
|---|---|---|---|---|---|
| **COMPONENT** | **COURSE CODE** | **COURSE TITLE** | **LEVEL** | **CREDIT** | **L-T-P** |
| Major (Core) | FOR142M101<br>FOR142M111 | Forest Ecology<br>Forest ecology practical | 100<br>100 | 3<br>3 | 2-1-0<br>0-0-6 |
| Minor | FOR142N101 | Basics of Forest Ecology | 100 | 3 | 2-1-0 |
| Interdisciplinary (IDC) | IKS992K101 | Indian Knowledge System - I | 100 | 3 | 3-0-0 |
| Ability Enhancement course (AEC) | CEN982A101<br>BHS982A102 | Communicative English<br>Behavioural Science-I | 100 | 1<br>1 | 1-0-0<br>1-0-0 |
| Skill Enhancement Course (SEC) | FOR142S121 | Plant Disease: Identification and control | 100 | 3 | 0-0-6 |
| Value Added Course (VAC) | VAC-1 | To be selected from the common basket | 100 | 3 | 3-0-0 |
| *MOOCs | MOOCs 1 | *MOOCs/online course will be identified by the dept. from the list of courses available on the MOOC online platform/SYAWAM portal | 100 | 3 | |
| **TOTAL CREDIT FOR 1st SEMESTER** | | | | 23 | |
| **2nd SEMESTER** | | | | | |
| **COMPONENT** | **COURSE CODE** | **COURSE TITLE** | **LEVEL** | **CREDIT** | **L-T-P** |
| Major (Core) | FOR142M201<br>FOR142M211 | Forest systematics & ethnobiology<br>Forest systematics & ethnobiology Practical | 100<br>100 | 3<br>3 | 2-1-0<br>0-0-6 |
| Minor | FOR142N201 | Forest Taxonomy & ethnobiology | 100 | 3 | 2-1-0 |
| IDC | IKS992K201 | Indian Knowledge System - II | 100 | 3 | 3-0-0 |
| AEC | CEN982A201<br>BHS982A202 | Communicative English-II<br>Behavioural Science-II | 100 | 1<br>1 | 1-0-0<br>1-0-0 |
| SEC | FOR142S221 | Plant Identification and Herbarium Techniques | 100 | 3 | 0-0-6 |
| VAC | | To be selected from the common basket | 100 | 3 | 3-0-0 |
| *MOOCs | MOOCs 2 | *MOOCs/online course will be identified by the dept. from the list of courses available on the MOOC online platform/SYAWAM portal | 100 | 3 | |
| **TOTAL CREDIT FOR 2nd SEMESTER** | | | | 23 | |
| **3rd SEMESTER** | | | | | |
| **COMPONENT** | **COURSE CODE** | **COURSE TITLE** | **LEVEL** | **CREDIT** | **L-T-P** |

| | | | | | |
|---|---|---|---|---|---|
| Major (Core) | FOR142M301<br>FOR142M311 | Forest Mensuration<br>Forest Mensuration Practical | 200<br>200 | 3<br>1 | 2-1-0<br>0-0-2 |
| | FOR142M302 | Silviculture & Nursery Technology | 200 | 4 | 3-1-0 |
| Minor | FOR142N301 | Forest Protection | 200 | 4 | 3-1-0 |
| IDC | | To be selected from Basket Course | 200 | 3 | 3-0-0 |
| AEC | | Communicative English and<br>Behavioural Science-III | 200 | 1<br>1 | 1-0-0<br>1-0-0 |
| SEC | FOR142S321<br>FOR142S321 | Geology & Soil science<br>Geology & Soil science Practical | 200 | 2<br>1 | 2-0-0<br>0-0-2 |
| *MOOCs | MOOCs 3 | *MOOCs/online course will be identified by the dept. from the list of courses available on the MOOC online platform/SYAWAM portal | 200 | 3 | |
| **TOTAL CREDIT FOR 3rd SEMESTER** | | | | 23 | |
| **4th SEMESTER** | | | | | |
| **COMPONENT** | **COURSE CODE** | **COURSE TITLE** | **LEVEL** | **CREDIT** | **L-T-P** |
| Major (Core) | FOR142M401<br>FOR142M402<br>FOR142M403<br>FOR142M413<br>FOR142M404 | Principles of Agroforestry<br>Forest Management<br>Forest Resources Utilization<br>Forest Resources Utilization Practical<br>Indigenous Practices in Forestry and Sustainable Resource Management (IKS) | 200<br>200<br>200<br>200<br>200 | 3<br>3<br>2<br>1<br>3 | 2-1-0<br>2-1-0<br>2-0-0<br>0-0-2<br>2-1-0 |
| Minor | FOR142N401<br>FOR142N402 | Wildlife Biology<br>Forest Ecology and Biodiversity Conservation | 200<br>200 | 3<br>3 | 3-1-0<br>3-1-0 |
| AEC | | Communicative English Behavioural Science-IV | 200<br>200 | 1<br>1 | 1-0-0<br>1-0-0 |
| *MOOCs | MOOCs 4 | *MOOCs/online course will be identified by the dept. from the list of courses available on the MOOC online platform/SYAWAM portal | 200 | 3 | |
| **TOTAL CREDIT FOR 4th SEMESTER** | | | | 23 | |
| **5th SEMESTER** | | | | | |
| **COMPONENT** | **COURSE CODE** | **COURSE TITLE** | **LEVEL** | **CREDIT** | **L-T-P** |
| Major (Core) | FOR142M501<br>FOR142M502<br>FOR142M512<br>FOR142M503<br>FOR142M513 | Forest Policy & Legislation<br>Plantation Forestry<br>Plantation Forestry Practical<br>Tree Improvement<br>Tree Improvement Practical | 300<br>300<br>300<br>300<br>300 | 4<br>3<br>1<br>3<br>1 | 3-1-0<br>2-1-0<br>0-0-2<br>2-1-0<br>0-0-2 |
| Minor | FOR142N501 | Farming based livelihood systems | 300 | 4 | 3-1-0 |
| **Internship/Research** | FOR142M521 | Internship/ Research Project | 300 | 4 | 0-0-0 |

| TOTAL CREDIT FOR 5th SEMESTER | | | | 20 | |
|---|---|---|---|---|---|
| **6th SEMESTER** | | | | | |
| **COMPONENT** | **COURSE CODE** | **COURSE TITLE** | **LEVEL** | **CREDIT** | **L-T-P** |
| Major (Core) | FOR142M601 | Forest Biotechnology | 300 | 3 | 2-1-0 |
| | FOR142M611 | Forest Biotechnology Practical | 300 | 1 | 0-0-2 |
| | FOR142M602 | Forest Economics and Marketing | 300 | 4 | 3-1-0 |
| | FOR142M603 | Remote Sensing and GIS Applications | 300 | 2 | 1-1-0 |
| | FOR142M613 | Remote Sensing and GIS Applications Practical | 300 | 2 | 0-0-4 |
| | FOR142M604 | Forest Tribology, Ethnomedicine and Extension | 300 | 3 | 2-1-0 |
| | FOR142M614 | Forest Tribology, Ethnomedicine and Extension Practical | 300 | 1 | 0-0-2 |
| Minor | FOR142N601 | Forest Entrepreneurship and Business Management | 300 | 4 | 3-1-0 |
| TOTAL CREDIT FOR 6th SEMESTER | | | | 20 | |
| **7th SEMESTER** | | | | | |
| **COMPONENT** | **COURSE CODE** | **COURSE TITLE** | **LEVEL** | **CREDIT** | **L-T-P** |
| Major (Core) | FOR142M701 | Wood Science and Technology | 400 | 3 | 2-1-0 |
| | FOR142M711 | Wood Science and Technology Practical | 400 | 1 | 0-0-2 |
| | FOR142M702 | Forest Biomass Energy and Biofuels | 400 | 4 | 3-1-0 |
| | FOR142M703 | Watershed Planning and Management | 400 | 3 | 2-1-0 |
| | FOR142M713 | Watershed Planning and Management Practical | 400 | 1 | 0-0-2 |
| | FOR142M704 | Industrial Agroforestry | 400 | 4 | 3-1-0 |
| Minor | FOR142N701 | Trees Outside Forests (TOF) | 400 | 4 | 3-1-0 |
| TOTAL CREDIT FOR 7th SEMESTER | | | | 20 | |
| **8th SEMESTER** | | | | | |
| **COMPONENT** | **COURSE CODE** | **COURSE TITLE** | **LEVEL** | **CREDIT** | **L-T-P** |
| Major (Core) | FOR142M801 | Innovations in Forest Product and Utilization | 400 | 4 | 3-1-0 |
| Minor | FOR142N801 | Research Methodology | 400 | 4 | 3-1-0 |
| Project / Dissertation | FOR142M821 | Dissertation | 400 | 12 | 0-0-0 |
| TOTAL CREDIT FOR 8th SEMESTER | | | | 20 | |

| Semester-I |
|---|
| **Paper I/Subject Name: Forest Ecology** |
| **Course Code: Major Subject Code: M101** |
| **L-T-P-C- 2-1-0-3** |
| **Credit Units: 3** |
| **Scheme of Evaluation: Theory** |

**Course Objective:** To provide knowledge about Forest ecosystem concept, stand dynamics forest succession, productivity and vegetation forms and natural regeneration of tree species.

**Course Outcomes:**

On completion of the course the students will be able to:

| Course Outcome | Course Outcome | Bloom's Taxonomy Level |
|---|---|---|
| CO 1 | Basic knowledge on the biomes of the world and the characteristics of temperate and tropical forests. The students will also be able to learn the various definitions of forest and the methods of classification of forests. | BT 1 |
| CO 2 | Understand history and development of Indian forestry, branches of forestry and systems of classification of forest types. | BT 2 |
| CO 3 | Awareness on importance of forests and the threats faced by forests including global climate change. | BT 3 |
| CO 4 | Basic skills in measurement of biodiversity of an area and acquaintance with biodiversity register | BT 4 |

**Detailed syllabus:**

| Modules | Topics (if applicable) & Course content | Periods |
|---|---|---|
| **I** | Forestry – definition, history and development of Indian Forestry. Branches of Forestry and their relationships. Major Forest ecosystem, forest environment, major abiotic and biotic components and their interaction. | **14** |
| **II** | Trophic levels: food chains, food webs, ecological pyramids and energy flow. Population ecology: population dynamics and carrying capacity, life table and its importance in forest management, nutrient cycling. | **14** |
| **III** | Community ecology: species interactions. Ecological succession: theories of succession, climax vegetation types; Forest management and succession; Biogeography. | **14** |
| **IV** | Autecology of important tree species, perturbation ecology. Biodiversity and conservation: distribution of diversity in different life forms, biodiversity hotspots, diversity measurement and diversity indices. Principles of conservation biology, Ex-situ and In-situ conservation, genetic and evolutionary principles in conservation; Biosphere concept, conservation efforts in India and worldwide. | **22** |

| Total | 64 |
|---|---|

| Credit Distribution | | |
|---|---|---|
| **Lecture/ Tutorial** | **Practicum** | **EL** |
| **60 hrs** | **-** | **30 hrs** |
| | | Field work, Assignment, Reflective thinking, case study, seminar, quiz |

**Textbooks:**


1. Ambasht, R.S. and Ambasht, N.K (2008). A Text Book of Plant Ecology. CBS Publishers and Distibutors. New Delhi, India.
2. Frankel, O.H., Brown, A.H.D., Burdon, J.J. (1995). The Conservation of Plant Biodiversity. Cambridge University Press. Cambridge.


**References:**


4. Misra, R. and Puri, G.S. (2013). Indian Manual of Plant Ecology. Scientific Publishers, Jodhpur, India.
5. Misra, K.C. (1991). Manual of Plant Ecology. Oxford and IBH Publishing Company, New Delhi.
6. Montagnini, F. and Jordan, C.F. (2005). Tropical Forest Ecology: The Basis for Conservation and Management. Springer.
7. Odum, E.P. (1996). Fundamentals of Ecology. Natraj Publishers, Dehra dun, India


| Semester-I |
|---|
| **Paper I/Subject Name: Forest Ecology (Practical)** |
| **Course Code: Major Subject Code: M111** |
| **L-T-P-C- 0-0-6-3** |
| **Credit Units: 3** |
| **Scheme of Evaluation: Theory** |

**Course Objective:** To provide hands on to study forest succession, diversity of organism in a forest ecosystem and the treats to this ecosystem.

**Course Outcomes:**

On completion of the course the students will be able to:

| Course Outcome | Course Outcome | Bloom's Taxonomy Level |
|---|---|---|
| CO 1 | Know different forest types in India and their composition | BT 1 |
| CO 2 | Study the composition of forest soil and the microclimatic conditions | BT 2 |
| CO 3 | Understand the different threats to forest ecosystem, and also the students will able to understand population dynamics. | BT 3 |
| CO 4 | Recognize the composition of a forest ecosystem and study the | BT 4 |

| | | |
|---|---|---|
| | succession in the field. | |

**Detailed syllabus:**

| Modules | Topics (if applicable) & Course content | Periods |
|---|---|---|
| I | 1. Visit a forest area, identify the forest type(s) and study the forest composition<br>2. Survey the trees/butterflies/birds of the campus and workout diversity indices viz. Simpson's Index, Shannon-Weiner Index, Berger Parker Dominance Index and Similarity indices.<br>3. Visit minimum five home gardens and prepare a model biodiversity register and to document the associated traditional knowledge. | **16** |
| II | 1. Estimating productivity of a site.<br>2. Study of microclimate and forest soils.<br>3. Study of ecological modifications of leaves. | **14** |
| III | 1. Effects of fire on forest ecosystem<br>2. Study of population dynamics using model systems<br>3. Preparation of life tables<br>4. Study of spatial dispersion among plants | **14** |
| IV | 1. Study of Forest composition<br>2. Study of succession in field/water bodies.<br>3. Visit to different ecosystems. | **22** |
| **Total** | | **64** |

| **Credit Distribution** | | |
|---|---|---|
| **Lecture/ Tutorial** | **Practicum** | **EL** |
| **-** | **90 hrs** | **-** |
| | | - |

**Textbooks:**

1. Michael, P. (1984). Ecological Methods for Field and Laboratory Investigations. Tata McGraw-Hill Publishing Company, New Delhi.

| Semester-I |
|---|
| **Paper I/Subject Name: Basics of Forest Ecology** |
| **Course Code: Minor Subject Code: N101** |
| **L-T-P-C- 2-1-0-3** |
| **Credit Units: 3** |
| **Scheme of Evaluation: Theory** |

**Course Objective:** To provide knowledge about Forest ecosystem concept, stand dynamics forest succession, productivity and vegetation forms and natural regeneration of tree species.

**Course Outcomes:**

On completion of the course the students will be able to:

| Course Outcome | Course Outcome | Bloom's Taxonomy Level |
|---|---|---|
| CO 1 | Basic knowledge on the biomes of the world and the characteristics of temperate and tropical forests. The students will also be able to learn the various definitions of forest and the methods of classification of forests. | BT 1 |
| CO 2 | Understand history and development of Indian forestry, branches of forestry and systems of classification of forest types. | BT 2 |
| CO 3 | Awareness on importance of forests and the threats faced by forests including global climate change. | BT 3 |
| CO 4 | Basic skills in measurement of biodiversity of an area and acquaintance with biodiversity register | BT 4 |

**Detailed syllabus:**

| Modules | Topics (if applicable) & Course content | Periods |
|---|---|---|
| **I** | Forestry – definition, history and development of Indian Forestry. Branches of Forestry and their relationships. Major Forest ecosystem in NE India, forest environment, major abiotic and biotic components and their interaction in forest ecosystem. | **16** |
| **II** | Trophic levels: food chains, food webs, ecological pyramids and energy flow in forest ecosystem. Population ecology: population dynamics and carrying capacity. | **16** |
| **III** | Community ecology: species interactions. Ecological succession: theories of succession, climax vegetation types; Biogeography. | **16** |
| **IV** | Biodiversity and conservation: distribution of diversity in different life forms, biodiversity hotspots, diversity measurement and diversity indices. Principles of conservation biology, Ex-situ and In-situ conservation. | **16** |
| **Total** | | **64** |

| Lecture/ Tutorial | Practicum | EL |
|---|---|---|
| **60 hrs** | **-** | **30 hrs** |
| | | Field work, Assignment, Reflective thinking, case study, seminar, quiz |

**Textbooks:**


1. Ambasht, R.S. and Ambasht, N.K (2008). A Text Book of Plant Ecology. CBS Publishers and Distibutors. New Delhi, India.
2. Frankel, O.H., Brown, A.H.D., Burdon, J.J. (1995). The Conservation of Plant Biodiversity. Cambridge University Press. Cambridge.


**References:**


1. Misra, R. and Puri, G.S. (2013). Indian Manual of Plant Ecology. Scientific Publishers, Jodhpur, India.
2. Misra, K.C. (1991). Manual of Plant Ecology. Oxford and IBH Publishing Company, New


| **Semester-I** |
|---|
| **SEC: PLANT DISEASE IDENTIFICATION AND CONTROL**<br>**Subject Code: BOT142S121** **L-T-P-C: 0-0-3-3,**<br>**Credit Units: 03**<br>**SCHEME OF EVALUATION: Practical (P)** |

**Course objective:** To introduce and develop basic concepts to the world of plant disease focusing on the management and control of pathogens and epidemics.

**Learning Outcomes: After the successful completion of the course the students will be able to:**

| | | |
|---|---|---|
| **CO1** | To **describe and identify** the physical dimensions, forms, functions and habitats of pathogens | **BT 2 and BT 3** |
| **CO2** | To **experiment with different** plant diseases in different crops | **BT 3** |
| **CO3** | To **examine and infer** from the studied specimen the type and its management of the disease in the plant kingdom | **BT 4** |

**Detailed Syllabus**

| Module | Course content | Lecture Hours |
|---|---|---|
| **I** | Plant disease introduction**:** Terms and concepts; Symptomology and identification of fungal, viral and bacterial plant diseases. Host-Pathogen relationships; Disease cycle and role of environment in disease development; prevention and control of plant diseases. Quarantine and its significance in control of plant diseases. | **15** |

| | | |
|---|---|---|
| II | Major epidemics and their social impacts. Legislative, cultural, and biological protection measures of plant diseases. Koch's postulates. Factors influencing infection,colonization, and development of symptoms. | 15 |
| III | **Laboratory and Analytical Techniques**<br>Preparation and sterilization of common media. Methods of isolation of plant pathogens andtheir identification. Preservation of microorganisms by pure culture method. Methods of inoculation.<br>Detection and Diagnosis of pathogens in seeds and other planting materials. | 15 |
| IV | Collection and study of Fungal, Bacterial and Viral Diseases of Crop Plants<br>Project on Management and control of Plant diseases | |
| | **Total** | 60 |

| CREDIT DISTRIBUTION | | |
|---|---|---|
| **LECTURE/TUTORIAL** | **PRACTICALS** | **EXPERIENTIAL LEARNING** |
| 00 | 60 | 30<br>FIELD VISITS, SAMPLE COLLECTION, SUBMISSION |

**TEXT BOOKS:**


1. Paul Khurana, S. M. 2009: Pathological Problems of Economic crop plants and their management.
2. Dubey, R.C. and Maheshwari, D.K. (1999). A text book of Microbiology, S. Chand & Company Ltd.,New Delhi, India


**REFERENCE BOOKS:**


1. Pelczar, M.J. Microbiology. 2005.Tata McGraw-Hill Co, New Delhi
2. Planke, J. E. Vander. (2013) Plant Diseases Epidemics and control.
3. Sinclair W.A. and H.H. Lyon. Diseases of Trees and Shrubs. 2005. Cornell University Press.
4. Webster J and Weber R.W.S. Introduction to Fungi. 2007. Cambridge University Press.
5. Lucas J.A. Plant Pathology and Plant Pathogens. 2011. John Wiley and Sons Ltd.
6. Williamson VM, Kumar A (2006) Nematode resistance in plants: the battle underground. Trends inGenetics 22: 396–403.


| Paper AEC | **Introduction to Effective Communication**<br>**L-T-P-C: 1-0-0-1 Credit Unit: 1 Evaluation Scheme: T** | Course Code CEN982A101 |
|---|---|---|

**Course Objective:**

To understand the four major aspects of communication by closely examining the processes and outlining the most effective ways to communicate with interactive activities.

**Course Outcome:**

| On successful completion of the course, the students will able to: | Bloom's cognitive level |
|---|---|

| | | |
|---|---|---|
| CO1 | List the elements and processes that make for successful communication and recognise everyday activities that deserve closer attention in order to improve communication skills | BT1 |
| CO2 | Contrast situations that create barriers to effective communication and relate them to methods that are consciously devised to overcome such hindrance | BT2 |
| | Apply language, gestures, and para-language effectively to avoid miscommunication and articulate one's thoughts and build arguments more effectively | BT3 |

**Detailed Syllabus**

| **Detailed Syllabus** | | |
|---|---|---|
| **Units** | **Course Contents** | **Periods** |
| **I** | Introduction to Effective Communication<br>• Listening Skills<br>o The Art of Listening<br>o Factors that affect Listening<br>o Characteristics of Effective Listening<br>o Guidelines for improving Listening skills | **5** |
| **II** | • Speaking Skills<br>o The Art of Speaking<br>o Styles of Speaking<br>o Guidelines for improving Speaking skills<br>o Oral Communication: importance, guidelines, and barriers | **5** |
| **III** | • Reading Skills<br>o The Art of Reading<br>o Styles of Reading: skimming, surveying, scanning<br>o Guidelines for developing Reading skills | **5** |
| **IV** | • Writing Skills<br>o The Art of Writing<br>o Purpose and Clarity in Writing<br>o Principles of Effective Writing | **5** |

**Texts:**


1. Rizvi, M. Ashraf. (2017). *Effective Technical Communication*. McGraw-Hill.
2. Chaturvedi, P. D. and Chaturvedi, Mukesh. (2014). *Business Communication.* Pearson.
3. Raman, Meenakshi and Sharma, Sangeeta. (2011). *Technical Communication: Principles and Practice* (2nd Edition): Oxford University Press.


| Credit Distribution | | |
|---|---|---|
| **Lecture/Tutorial** | **Practicum** | **Experiential Learning** |
| 15 hours | - | 10 hours<br>- Movie/ Documentary /Podcasts screening<br>- Peer teaching |

| Paper AEC | **Behavioural Sciences -1**<br>**L-T-P-C: 1-0-0-1 Credit Unit: 1 Evaluation Scheme: T** | Course Code BHS982A104 |
|---|---|---|

**Course objectives:** To increase one's ability to draw conclusions and develop inferences about attitudes and behaviour, when confronted with different situations that are common in modern organizations.

**Course Outcomes:** On completion of the course the students will be able to :

CO1: Understand self & process of self exploration

CO2: Learn about strategies for development of a healthy self esteem

CO3: Apply the concepts to build emotional competencies.

**Detailed Syllabus:**

| Modules | Course Contents | Periods |
|---|---|---|
| I | **Introduction to Behavioral Science**<br>Definition and need of Behavioral Science,Self: Definition components, Importance of knowing self, Identity Crisis,Gender and Identity, Peer Pressure, Self image: Self Esteem, Johari Window ,Erikson's model. | 4 |
| II | **Foundations of individual behavior**<br>Personality- structure, determinants, types of personalities.<br>Perception: Attribution, Errors in perception.<br>Learning- Theories of learning: Classical, Operant and Social | 4 |
| III | **Behaviour and communication.**<br>Defining Communication, types of communication, barriers to communication, ways to overcome barriers to Communication, Importance of Non-Verbal Communication/Kinesics, Understanding Kinesics, Relation between behaviour and communication. | 4 |
| IV | **Time and Stress Management**<br>Time management: Introduction-the 80:20, sense of time management, Secrets of time management, Effective scheduling.<br>Stress management: effects of stress, kinds of stress-sources of stress, Coping Mechanisms.<br>Relation between Time and Stress. | 4 |
| **Total** | | **16** |

**Text books**


• J William Pfeiffer (ed.) Theories and Models in Applied Behavioural Science, Vol 3, Management; Pfeiffer &Company

• Blair J. Kolasa, Introduction to Behavioural Science for Business, John Wiley & Sons Inc

• K.Alex, Soft skills; S.Chand.

| Paper IKS-I | Introduction to Indian Knowledge System – I<br><br>L-T-P-C: 2-1-0-3. Credit Unit: 3 Evaluation Scheme: T | Course Code IKS992I101 |
|---|---|---|

**Course objectives:**

This Foundation course is designed to present an overall introduction to all the streams of IKS relevant to the UG program. It would enable students to explore the most fundamental ideas that have shaped Indian Knowledge Traditions over the centuries.

**Course Outcomes:**

On completion of this course students will be able to –

| CO | Contents | BT Level |
|---|---|---|
| $CO_1$ | **Recall** the rich heritage of Indian knowledge systems | BT level 1 |
| $CO_2$ | **Describe** the contribution of Indian knowledge systems to the world | BT level 2 |
| $CO_3$ | **Demonstrate** knowledge of sociocultural and ethnolinguistic diversity that constitutes the soul of Bharatvarsha | BT level 2 |
| $CO_4$ | **Apply** traditional knowledge and techniques in day-to-day life | BT level 3 |
| $CO_5$ | **Distinguish** knowledge traditions that originated in the Indian subcontinent | BT level 3 |

| Module | Course Contents | Periods |
|---|---|---|
| I | **Introduction to Indian Knowledge Systems (IKS):**<br>-What is the Indian Knowledge System?<br>-Definition of Indigenous/ Traditional Knowledge<br>-Scope, and Importance of Traditional Knowledge.<br>**Ancient India- Bharat Varsha:**<br>-People of Ancient Bharat Varsha<br>-Our great natural heritage: The great Himalayas and the rivers.<br>- The civilizations of the Sindhu-Ganga valley, and the Brahmaputra valley.<br>-Our coastal plains.<br>-Our Nature: Forests and Minerals<br>-Ancient Indian Traditional Knowledge and Wisdom about nature and climate. | 15 |
| II | **Indian Heritage of Knowledge:**<br>-Ancient Indian Knowledge: The *Vedas* and its components-the *Vedangas*<br>-Ancient Indian books and treaties: The *Sastras*.<br>-The Great Indian Epics: The Ramayana and The Mahabharata, | 15 |

| | | |
|---|---|---|
| | -Epics and religious treaties of ancient Assam: Introduction to Madhav Kandali's *Ramayan* and Srimanta Sankardev's *Dasam Skandha Bhagavat* of the Puranas.<br><br>-Ancient Traditional Knowledge-The *Agamas*<br><br>-The ancient Buddhist knowledge: *Tripitaka: Vinaya, Sutta* and *Abhidhamma Pitaka*<br><br>**<u>Languages and language studies in India</u>**:<br><br>-What is linguistics?<br><br>-Script and Language<br><br>-Alphabet of the Indian languages *Varnamala:* Origin, Evolution, and phonetic features.<br><br>-Languages of India<br><br>-Important texts of Indian languages: Skills *Siksha,* Expression/Prounciation-*Nirukta,* Grammer-*Vyakarana,* Poetic rhythm-*Chandas.*<br><br>-Paninian Grammar: A Brief Introduction<br><br>**<u>Introduction to Fine Arts and Performing Arts of India:</u>**<br><br>-Ancient Indian classical music and dance forms: The Science of Dramas-*Natyasastra* and the Science of Music-*Gandharva-Veda.*<br><br>-Aesthetics in Indian Art and Culture.<br><br>-Folk music and traditional dance forms of the Northeast. | |
| III | **<u>Indian Science & Technology</u>**<br><br>-Ancient India's contribution to Mathematics- Number System. Algebra and Arithmetic, Geometry and Trigonometry.<br><br>-Origin of Decimal system in India; nomenclature of numbers in the Vedas. Zero and Infinity. Sulba-sutras. Contribution of Brahmagupta and Sridhar Acharya to Mathematics. Important texts of Indian mathematics.<br><br>• **<u>Indian Astronomy</u>:** Planetary System. Motion of the Planets. Velocity of Light. Eclipse. Astronomy. Navagrahas. Important works in Indian Astronomy. Aryabhata and Nilakantha: Contribution to Astronomical Studies | 15 |

| | | |
|---|---|---|
| | • **<u>Indian Metal Works</u>:** Mining Techniques. Types of Metals. Tools & Techniques for Metal Smelting with examples. Metalworks in pre-modern India: Special reference to NE India. | |
| IV | **<u>Contribution of Ancient India to Health Sciences</u>:**<br>-Traditional Indigenous systems of medicines in India:<br>- *Ayurveda* and *Yoga:* Elements of *Ayurveda: Gunas* and *Doshas*, *Pancha Mahabhuta* and *Sapta-dhatu*.<br>-Concept of disease in Ayurveda<br>-Ayurvedic lifestyle practices: *Dinacharya* and *Ritucharya.*<br>-Important Ayurvedic Texts<br>-Hospitals in Ancient India<br>• -*Ayurveda*: Gift of India to the modern world. | 15 |
| EL | The experiential learning sessions may include:<br>• Field Visits: Organizing visits to historical sites, museums, traditional craft centers, and other places relevant to Indian knowledge systems.<br>• Interactive Sessions: Engaging students in discussions with experts and practitioners in various fields of Indian knowledge systems to gain insights and practical knowledge.<br>• Online Lecture Series: Providing the students with online lectures by distinguished experts in the field of the Indian Knowledge System.<br>• Hands-on Activities: Providing opportunities for students to participate in activities related to traditional arts, crafts, music, dance, agriculture, etc., to understand the practical aspects of Indian knowledge systems.<br>• Practical Demonstrations: Conducting workshops or sessions to demonstrate traditional practices, such as yoga, Ayurveda, Vastu Shastra, etc., for the students. | 30 |
| | Total | 90 |

**Textbooks Books:**


1. Mahadevan, B., Bhat Vinayak Rajat, Nagendra Pavan RN. (2022), Introduction to Indian Knowledge System: Concepts and Applications. PHI Learning Private Ltd.
2. Mukul Chandra Bora, Foundations of Bharatiya Knowledge System. Khanna Book Publishing


**Reference Books:**


1. Baladev Upadhyaya, Samskrta Śāstrom ka Itihās, Chowkhambha, Varanasi, 2010. D. M. Bose, S. N. Sen and B. V. Subbarayappa, Eds., A Concise History of Science in India, 2nd Ed., Universities Press, Hyderabad, 2010.
2. Astāngahrdaya, Vol. I, Sūtrasthāna and Śarīrasthāna, Translated by K. R. Srikantha Murthy, Vol. I, Krishnadas Academy, Varanasi, 1991.
3. Dharampal, The Beautiful Tree: Indian Indigenous Education in the Eighteenth Century, Dharampal Classics Series, Rashtrotthana Sahitya, Bengaluru, 2021.
4. J. K. Bajaj and M. D. Srinivas, Indian Economy, and Polity in Eighteenth-century Chengalpattu, in J. K. Bajaj ed., Indian Economy and Polity, Centre for Policy Studies, Chennai, 1995, pp. 63-84.

| Semester-II |
|---|
| **Paper I/Subject Name: Forest Systematics and Ethnobiology** |
| **Course Code: Major Subject Code: M201** |
| **L-T-P-C-2-1-0-3** |

| Scheme of Evaluation: Theory |
|---|

**Course Objective:** The course is designed to provide basic knowledge of taxonomy in relation to forest and also to familiarize then with ethnomedicinal plants and animals and their traditional use in health care systems.

**Course Outcomes:**
On completion of the course the students will be able to:

| Course Outcome | Course Outcome | Bloom's Taxonomy Level |
|---|---|---|
| CO 1 | Acquaintance about the forest Systematics and Ethnobiology and significance of ethnobotany and ethnozoology in NE India. | BT 1 |
| CO 2 | To familiarize with taxonomic research in India. | BT 2 |
| CO 3 | To provide information related to characterization and economic importance of different families of dicot and monocot plants. | BT 3 |
| CO 4 | Develop basic methodologies of ethnobiology and to understand the role of plants and animals in health care and drug discovery | BT 4 |

**Detailed syllabus:**

| Modules | Topics (if applicable) & Course content | Periods |
|---|---|---|
| **I** | Principles of Systematics (taxonomy), Systems of classifications; Post Darwinian systematics; Concept of species and genera; Modern trends in Taxonomy, Biosystematics & Numerical Taxonomy; Phenetic, Cladistic, Omega and Alpha taxonomy; Role of taxonomy in management and conservation of forest. | **16** |
| **II** | Concept of characters; Botanical keys, their use and construction; Principles of plant nomenclature; Concept of ICBN, Typification; Principle of Priority; Valid publication, Naming of new taxon; Taxonomic literature: Classical literatures, Icons, Flora, Revision and Monograph, Taxonomic research in India, Botanical survey of India, Herbaria of India and abroad. | **16** |
| **III** | Characterization and Economic importance of selected order and Families of Dicots and Monocots I: Ranales (Magnoliaceae & Annonaceae), Guttiferales (Clusiaceae & Dipterocarpaceae), Malvales (Malvaceae & Sterculiaceae), Ruttales (Rutaceae & Meliaceae), Rosales (Rosaceae & Leguminosae), Myrtales (Combretaceae & Myrtaceae), Rubiales (Rubiaceae), Verbenales (Verbenaceae), Asterales (Asteraceae), Unisexuales (Euphorbiaceae & Moraceae), Orchidales (Orchidaceae), Palmales (Arecaceae), Poales (Poaceae) | **16** |
| **IV** | Scope, objectives and methodologies of ethnobiology (Ethnobotany and Ethnozoology); Ethnobotany in relation to health care and drug discovery (Ethnomedicine & Ethnopharmacology), Contribution of wildlife products to human welfare; Hunting of wildlife; Importance and prospects of Ethnobiological studies in North Eastern India. | **16** |
| **Total** | | **64** |

| Credit Distribution |
|---|

| Lecture/ Tutorial | Practicum | EL |
|---|---|---|
| **60 hrs** | **-** | **30 hrs** |
| | | Field work, Assignment, Reflective thinking, case study, seminar, quiz |

**Textbooks:**

1. A Text Book of Forest Taxonomy, MP Singh, MP Nayar& RP Ray, Amol Publication, New Delhi, 1994.
2. An Introduction to Plant Taxonomy, C. Jeffery, Cambridge University Press, Cambridge, 1982.
3. Plant Taxonomy – O.P. Sharma, Tata Mac Graw Hill, New Delhi, 1993.
4. Taxonomy of Angiosperms Nair R. Publisher: Aph Publishing Corporation. 2010
5. Plant Taxonomy: Advances and Relevance, 1st Edition: A. K. Pandey, et al. CBS Publisher; 2010

**References:**

1. Plant Taxonomy and Biosystematics, C. A. Stace, Edward Arnold, London, 1989.
2. Introduction to the Principle of Taxonomy, V.V. Sivarajan, edited by N. K. P. Robson, Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi, Calcutta.
3. Ethnobotany-Gary J. Martyn, Chapman& Hall, London,1995.

| **Semester-II** |
|---|
| **Paper I/Subject Name: Forest Systematics and Ethnobiology (Practical)**<br>**Course Code: Major Subject Code: M211**<br>**L-T-P-C- 0-0-6-3**<br>**Credit Units: 3**<br>**Scheme of Evaluation: Theory** |

**Course Objective:** To provide hands for herbarium collection and its preservation, to have better knowledge about plants plants with ethnomedicinal importance, their documentation and classification.

**Course Outcomes:**

On completion of the course the students will be able to:

| Course Outcome | Course Outcome | Bloom's Taxonomy Level |
|---|---|---|
| CO 1 | To prepare herbarium with fair knowledge of herbarium preparation techniques | BT 1 |
| CO 2 | To understand the various techniques and field practices of ethnobotany and ethnozoology | BT 2 |
| CO 3 | To determine the importance value Index (IVI) of traditionally used medicinal plants | BT 3 |
| CO 4 | Comprehend the major ethnomedicinal plants used in NE India and their purpose of use. | BT 4 |

**Detailed syllabus:**

| Modules | Topics (if applicable) & Course content | Periods |
|---|---|---|
| **I** | 1. Plant collection and Herbarium Technique.<br>2. Survey, collection and identification of tree flora Phytography (description of | **16** |

| | | |
|---|---|---|
| | plants) and identification of the family, genus and species with the help of Taxonomic literature (Flora etc.).<br>3. Techniques for preparation of herbarium and submission of minimum twenty herbarium specimens. | |
| **II** | 1. Preparation of field note book pertinent to floristic study.<br>2. Methods and field practices of Ethnobotany and ethnozoology.<br>3. Collection and preservation of traditionally used dead biological samples. | **16** |
| **III** | 1. Preparation of Keys for the trees of campus/botanical garden<br>2. Spot characters and floral features of families-Annonaceae<br>3. Determination of Importance Value Index of Plant Species/Ethnomedicinal herbs | **16** |
| **IV** | 1. To visit botanical garden/herbal garden/medicinal plant repositories for the identification of ethnomedicinal plants<br>2. To study the major ethnomedicinal plants and practices followed in NE India<br>3. To study morphological description and identification of various medicinal plants. | **16** |
| **Total** | | **64** |

| **Credit Distribution** | | |
|---|---|---|
| **Lecture/ Tutorial** | **Practicum** | **EL** |
| **-** | **90 hrs** | **-** |
| | | - |

**Textbooks:**

1. Plant Taxonomy & Embryology (With Practical Manual)- Satish Kumar, India
2. Methods and Approaches in Ethnobotany – SK Jain (Ed). SEB, Lucknow.

| **Semester-II** |
|---|
| **Paper I/Subject Name: Forest Taxonomy and Ethnobiology**<br>**Course Code: Major Subject Code: N201**<br>**L-T-P-C- 2-1-0-3**<br>**Credit Units: 3**<br>**Scheme of Evaluation: Theory** |

**Course Objective:** The course is designed to provide basic knowledge of taxonomy in relation to forest and also to familiarize then with ethnomedicinal plants and animals and their traditional use in health care systems.

**Course Outcomes:**
On completion of the course the students will be able to:

| Course Outcome | Course Outcome | Bloom's Taxonomy Level |
|---|---|---|
| CO 1 | Acquaintance about the forest taxonomy and Ethnobiology and significance of ethnobotany and ethnozoology in NE India. | BT 1 |
| CO 2 | To familiarize with taxonomic research in India. | BT 2 |
| CO 3 | To provide information related to characterization and economic importance of different families of dicot and monocot plants. | BT 3 |
| CO 4 | Develop basic methodologies of ethnobiology and to understand the role of plants and animals in health care and drug discovery | BT 4 |

**Detailed syllabus:**

| Modules | Topics (if applicable) & Course content | Periods |
|---|---|---|
| I | Concept of species and genera; Modern trends in Taxonomy, Biosystematics & Numerical Taxonomy; Phenetic, Cladistic, Omega and Alpha taxonomy; Role of taxonomy in management and conservation of forest. | **16** |
| II | Concept of characters; Botanical keys, their use and construction; Principles of plant nomenclature; Concept of ICBN, Typification; Principle of Priority; Valid publication, Naming of new taxon. | **16** |
| III | Characterization and Economic importance of selected order and Families of Dicots and Monocots: Ranales (Magnoliaceae & Annonaceae), Guttiferales (Clusiaceae & Dipterocarpaceae), Malvales (Malvaceae & Sterculiaceae), Ruttales (Rutaceae & Meliaceae), Rosales (Rosaceae & Leguminosae), Myrtales (Combretaceae & Myrtaceae), Rubiales (Rubiaceae), Verbenales (Verbenaceae), Asterales (Asteraceae), Unisexuales (Euphorbiaceae & Moraceae), Orchidales (Orchidaceae), Palmales (Arecaceae), Poales (Poaceae) | **16** |
| IV | Scope, objectives and methodologies of ethnobiology (Ethnobotany and Ethnozoology); Ethnobotany in relation to health care and drug discovery (Ethnomedicine & Ethnopharmacology). | **16** |
| **Total** | | **64** |

| **Credit Distribution** | | |
|---|---|---|
| **Lecture/ Tutorial** | **Practicum** | **EL** |
| **60 hrs** | **-** | **30 hrs** |
| | | Field work, Assignment, Reflective thinking, case study, seminar, quiz |

**Textbooks:**

1. Taxonomy of Angiosperms Nair R. Publisher: Aph Publishing Corporation. 2010
2. Plant Taxonomy: Advances and Relevance, 1st Edition: A. K. Pandey, et al. CBS Publisher; 2010

**References:**

1. Plant Taxonomy and Biosystematics, C. A. Stace, Edward Arnold, London, 1989.
2. Introduction to the Principle of Taxonomy, V.V. Sivarajan, edited by N. K. P. Robson, Oxford and IBH

Publishing Co. Pvt. Ltd. New Delhi, Calcutta.
3. Ethnobotany-Gary J. Martyn, Chapman& Hall, London,1995.

**SEC: PLANT IDENTIFICATION AND HERBARIUM TECHNIQUES**
**Subject Code: BOT142S121 L-T-P-C: 0-0-3-3,**
**Credit Units: 03**
**SCHEME OF EVALUATION: Practical (P)**

**Course objective:** To impart practical knowledge on various plant identification systems, their preservation and utilization.

**Learning Outcomes**: At the end of the course the student will be:

| | | |
|---|---|---|
| CO1 | **Identify, describe,** and practice different methods of plant identification Systems | BT 2 & 3 |
| CO2 | **Categorize** different techniques used in preservation and utilize its knowledge in various field of application | BT 4 |

**Detailed Syllabus:**

| Module | Course content | Lecture hours |
|---|---|---|
| I | **Plant identification:** Introduction, importance of plant identification. **Tools of identification:** Expert determination, Herbarium, taxonomic literature (Floras, Manuals, Monographs, Icons, Journals, Supporting literature), taxonomic keys, interactive keys/ visual keys, Computers in identification, molecular plantidentification. | **22** |
| II | **Plant nomenclature:** History of organized nomenclature, International Code of Nomenclature for Algae, Fungi and Plants (ICN)- ranks of taxa, valid and effective publications, principle of priority, changes of names, rejection of names, name of hybrids, and cultivated plants. | **22** |
| III | **Herbarium:** Introduction, definition, history, objective, types of herbaria, importance, major herbaria in the world and India. **Herbarium techniques:** Preparation for collection; field equipment, kinds of field work, Ethical guidelines for field works. Maintenance of Herbarium. | **22** |
| IV | **Herbarium Techniques for special types of plants:** Aquatic plants, cane, bamboo, succulents, rhizomatous plants, resinous plants, algae, Lichens, wild mushrooms, and bryophytes.<br>**Digital/virtual herbarium**: Introduction and importance of digital herbaria.<br>**Practical/ Project based on the syllabus.** | **24** |
| **Total** | | **90** |

| CREDIT DISTRIBUTION | | |
|---|---|---|
| **LECTURE/TUTORIAL** | **PRACTICALS** | **EXPERIENTIAL LEARNING** |

| | | |
|---|---|---|
| 00 | 60 | 30<br>• FIELD VISITS<br>• SAMPLE COLLECTION<br>• HERBARIUM PREPARATION & SUBMISSION |

**Textbooks:**


1. Simpson, M. G. 2006. Plant Systematics. Elsevier, Amsterdam
2. Rao and Jain 1976. A Handbook of Field and Herbarium methods
3. Singh, G. 2012. Plant Systematics- Theory and Practice. Oxford and IBH Publishing Co Pvt Ltd, NewDelhi
4. Sharma and Sharma 2007. Taxonomy. Pragati Prakashan, Meerut


**Reference Books:**


5. Anderson, N. O., and J. D. Walker. 2003. Effectiveness of Web-based versus live plant identification tests. Horttechnology 13:199-205.
6. Dirr, M. A. 1998. Manual of Woody Landscape Plants: Their Identification, Ornamental Characteristics,Culture, Propagation and Uses. Stipes Publishing, Champaign, IL
7. Kahtz, A. W. 2000. Can computer assisted instruction be used by students for woody plant identification. Horttechnology 10:381-384.


| **Paper AEC** | **Approaches to Verbal and Non-Verbal Communication**<br><br>**L-T-P-C: 1-0-0-1 Credit Unit: 1 Evaluation Scheme: T** | **Course Code CEN982A201** |
|---|---|---|

**Course Objectives**

To introduce the students to the various forms of technical communication and enhance their knowledge in the application of both verbal and non-verbal skills in communicative processes. **Course Outcomes**

| **On successful completion of the course the students will be able to:** | | |
|---|---|---|
| **CO Level** | **Course Outcome** | **Blooms Taxonomy Level** |
| **CO 1** | **List** the different types of technical communication, their characteristics, their advantages and disadvantages. | **BT 1** |
| **CO 2** | **Explain** the barriers to communication and ways to overcome them. | **BT 2** |
| **CO 3** | **Identify** the means to enhance conversation skills. | **BT 3** |
| **CO 4** | **Determine** the different types of non-verbal communication and their significance. | **BT 4** |

**Detailed Syllabus**

| Modules | Topics (if applicable) & Course Contents | Periods |
|---|---|---|
| I | **Technology Enabled Communication**<br>Communicating about technical or specialized topics, Different forms of technology-enabled communication tools used in organizations Telephone, Teleconferencing, Fax, Email, Instant messaging, Blog, Podcast, Videos, videoconferencing, social media | **4** |
| II | **Communication Barriers**<br>Types of barriers: Semantic, Psychological, Organisational, Cultural, Physical, Physiological, Methods to overcome barriers to communication. | **4** |
| III | **Conversation skills/Verbal Communication**<br>Conversation – Types of Conversation, Strategies for Effectiveness, Conversation Practice, Persuasive Functions in Conversation, Telephonic Conversation and Etiquette Dialogue Writing, Conversation Control. | **4** |
| IV | **Non-verbal Communication**<br>Body language- Personal Appearance, Postures, Gestures, Eye Contact, Facial expressions Paralinguistic Features-Rate, Pause, Volume, Pitch/Intonation/ Voice/Modulation, Proxemics, Haptics, Artifacts, Chronemics, | **4** |
| | **Total** | **16** |

**Texts:**


1. Rizvi, M. Ashraf. (2017). *Effective Technical Communication*. McGraw-Hill.
2. Chaturvedi, P. D. and Chaturvedi, Mukesh. (2014). *Business Communication.* Pearson.
3. Raman, Meenakshi and Sharma, Sangeeta. (2011). *Technical Communication: Principles and Practice* (2nd Edition): Oxford University Press.


| Paper<br>AEC | Behavioural Sciences -II<br><br>L-T-P-C: 1-0-0-1 Credit Unit: 1 Evaluation Scheme: T | Course Code<br>BHS982A204 |
|---|---|---|

**Course objectives:** To increase one's ability to draw conclusions and develop inferences about attitudes and behaviour, when confronted with different situations that are common in modern organizations.

**Course outcomes:** On completion of the course the students will be able to:

CO 1: Develop an elementary level of understanding of culture and its implications on personality of people.

CO2: Understand the concept of leadership spirit and to know its impact on performance of employees.

CO3: Understand and apply the concept of Motivation in real life.

| Modules | Course Contents | Periods |
|---|---|---|
| I | **Culture and Personality**<br>Culture: Definition, Effect, relation with Personality, Cultural Iceberg, Overview of Hofstede's Framework, Discussion of the four dimensions of Hofstede's Framework. | 4 |
| II | **Attitudes and Values**<br>Attitude's definition: changing our own attitudes, Process of cognitive dissonance Types of Values, Value conflicts, Merging personal and Organisational values | 4 |
| III | **Motivation**<br>Definition of motivation with example, Theories of Motivation (Maslow, McClelland's theory& Theory X and Y) | 4 |
| IV | **Leadership**<br>Definition of leadership, Leadership continuum, types of leadership, Importance of Leadership, New age leaderships: Transformational & transactional Leadership, Leaders as role models. | 4 |
| **Total** | | **16** |

**Text books:**


• J William Pfeiffer (ed.) Theories and Models in Applied Behavioural Science, Vol 3, Management; Pfeiffer &Company

• Blair J. Kolasa, Introduction to Behavioural Science for Business, John Wiley & Sons Inc.

• Organizational Behaviour by Kavita Singh (Vikas publishers, 3rd Edition).


| Paper<br>IKS-II | Introduction to Indian Knowledge System – II<br><br>L-T-P-C: 2-1-0-3 Credit Unit: 3 Evaluation Scheme: T | Course Code<br>IKS992I201 |
|---|---|---|

**Course objectives:**

This Foundation course is designed to present an overall introduction to all the streams of IKS relevant to the UG program. It would enable students to explore the most fundamental ideas that have shaped Indian Knowledge Traditions over the centuries.

**Course Outcomes:**

On completion of this course, students will be expected to –

| CO | Contents | BT Level |
|---|---|---|
| $CO_1$ | **Recall** traditional Indian knowledge traditions constituting Indian culture | BT level 1 |
| $CO_2$ | **Summarize differences** between classical literature in Sanskrit and other Indian languages | BT level 2 |
| $CO_3$ | **Compare** knowledge traditions originating in NE India | BT level 2 |
| $CO_4$ | **Appreciate** the contribution of Indian Knowledge Systems to the world | BT level 3 |

| Module | Course Contents | Periods |
|---|---|---|
| I | **Indian Classical Literature**<br>Indian Classical Literature: A Brief Introduction. | 15 |

| | | |
|---|---|---|
| | - Ancient Indian Spritual Poetics-*Kavya*: Contribution of Kalidasa<br>**Diversity and Indian Culture**:<br>- Diversity and Indian Culture<br>-Indigenous Faith and Religion<br>-Preservation of culture and indigenous knowledge<br>**The Purpose of** Knowledge<br>- Understanding Self-Awareness and Spirituality.<br>-Indian concept and purpose of Knowledge and Education<br>- Understanding Spirituality and Materialism: *Para* and *Apara Vidya* | |
| II | **Methodology of Indian Knowledge System**:<br>- *Shruti* and *Smriti* traditions.<br>-Intoduction to *Shastras.*<br>-Manuscriptology: The art and science of documenting knowledge.<br>- Repositories of ancient manuscripts with special reference to the Norteast India.<br>**Indian Architecture and Town Planning:**<br>- Introduction ancient Indian architecture.<br>- *Sthapatya-Veda*: An Introduction<br>- Indigenous tools & techniques for town planning & Temple Architecture. Lothal, Mohan Jo Daro.<br>- Temple Art: Lepakshi Temple, Jagannath Puri Temple, Konark Sun Temple.<br>- Vernacular architecture of Assam: Special reference to Brahmaputra Valley | 15 |
| III | **Indian Agriculture**:<br>- Agriculture: Significance in Human Civilization.<br>- Sustainable Agriculture.<br>- Historical significance of agriculture and sustainable farming in India.<br>- Step Cultivation of India: Special reference to Northeast India.<br>- Wet rice cultivation of Assam.<br>**Indian Textiles**:<br>What is Textile? | 15 |

| | | |
|---|---|---|
| | - Tradition of cotton and silk textiles in India.<br>- The historical contribution of textile and weaving to the Indian economy.<br>- Varieties of textiles and dyes developed in different regions of India with special reference to Northeast India | |
| IV | **<u>Indian Polity and Economy</u>**:<br>- Understanding Kingdom and Chiefdom<br>- Role of a king<br>- The Indian idea of a well-organized polity and flourishing economy.<br>- The *Chakravarti* System: Administrative System of Ancient Bharatvarsha.<br>- Village administrative system: Northeast India.<br>- *Arthashastra*: Brief synopsis<br>**<u>The outreach of Indian Knowledge System across Geographical Boundaries</u>**<br>- Indian Languages.<br>- Scripts.<br>- Linguistics.<br>- Ayurveda.<br>- Yoga and Meditation.<br>- Textile<br>- Decimal value place system-based arithmetic, Algebra and Astronomy | 15 |
| EL | The experiential learning sessions may include:<br><br>• Field Visits: Organizing visits to historical sites, museums, traditional craft centers, and other places relevant to Indian knowledge systems.<br>• Interactive Sessions: Engaging students in discussions with experts and practitioners in various fields of Indian knowledge systems to gain insights and practical knowledge.<br>• Online Lecture Series: Providing the students with online lectures by distinguished experts in the field of the Indian Knowledge System.<br>• Hands-on Activities: Providing opportunities for students to participate in activities related to traditional arts, crafts, music, dance, agriculture, etc., to understand the practical aspects of Indian knowledge systems. | 30 |

| | | |
|---|---|---|
| | • Practical Demonstrations: Conducting workshops or sessions to demonstrate traditional practices, such as yoga, Ayurveda, Vastu Shastra, etc., for the students. | |
| | Total | 90 |

**Textbooks Books:**


1. Mahadevan, B., Bhat Vinayak Rajat, Nagendra Pavan RN. (2022), *Introduction to Indian Knowledge System: Concepts and Applications.* PHI Learning Private Ltd.
2. Mukul Chandra Bora*, Foundations of Bharatiya Knowledge System.* Khanna Book Publishing


**Reference Books:**


1. Baladev Upadhyaya, *Samskrta Śāstrom ka Itihās*, Chowkhambha, Varanasi, 2010.
2. D. M. Bose, S. N. Sen and B. V. Subbarayappa, Eds., *A Concise History of Science in India*, 2nd Ed., Universities Press, Hyderabad, 2010.
3. Astāngahrdaya, Vol. I, *Sūtrasthāna and Śarīrasthāna*, Translated by K. R. Srikantha Murthy, Vol. I, Krishnadas Academy, Varanasi, 1991.
4. Dharampal, *The Beautiful Tree: Indian Indigenous Education in the Eighteenth Century*, Dharampal Classics Series, Rashtrotthana Sahitya, Bengaluru, 2021.
5. J. K. Bajaj and M. D. Srinivas, *Indian Economy and Polity in Eighteenth century Chengalpattu*, in J. K. Bajaj ed., Indian Economy and Polity, Centre for Policy Studies, Chennai, 1995, pp. 63-84.

## B. Sc. Course in Forestry: Semester-III

| Paper I Major | Forest Mensuration<br><br>L-T-P-C: 2-1-0-3 Credit Unit: 3 Evaluation Scheme: T | Course Code FOR142M301 |
|---|---|---|

**Course Objective:**

This course aims to provide students with foundational knowledge and practical skills in forest mensuration, including measurement techniques, growth analysis, and advanced applications essential for managing forest resources effectively.

**Course Outcome:**

| On successful completion of the course, the students will able to: | | Bloom's cognitive level |
|---|---|---|
| CO1 | Define key concepts in forest mensuration, including objectives, measurement scales, and units of measurement. | BT1 |
| CO2 | Explain the principles of tree form, area measurement, and the significance of precision, accuracy, and bias in forest measurements. | BT2 |

**Detailed Syllabus**

| Modules | Title of Unit and Contents | Hours |
|---|---|---|
| I | **Fundamentals of Forest Mensuration and Measurement Techniques**<br>Forest Mensuration: Definition and objectives; scales of measurement; units of measurements; precision, bias, and accuracy.<br>Measurement of Diameter and Girth: Place of measurement; rules governing breast height (BH) measurements; instruments used in measurements; diameter and girth classes.<br>Measurement of Height: Definitions; methods of height measurement including ocular, non-instrumental, and instrumental methods; sources of error in height measurements, including leaning trees. | 16 |
| II | **Tree Form, Area, and Volume Estimation**<br>Tree Stem Form: Metzger's theory; form factor; types of form factor; form height quotient; form class.<br>Estimation of Area: Cross-sectional area, basal area, and bole surface area.<br>Volume Estimation: Methods of measuring the volume of standing trees, logs, and branch wood; formulae involved; definitions.<br>Volume Tables: Preparation of volume tables using graphical and regression methods. | 16 |
| III | **Tree Growth and Increment Analysis**<br>Determination of Growth of Trees: Concepts of increment, Current Annual Increment (CAI), Mean Annual Increment (MAI), and increment percent.<br>Determination of Tree Age and Growth: Techniques for determining the age of trees and the classification of increments.<br>Measurement of Tree Crops: Objectives; measurement of crop diameter, crop height, crop age, and crop volume. | 16 |
| | **Total** | 48 |

**Textbooks:**

1. Chaturvedi, A.N and L.S. Khanna (2011). Forest Mensuration and Biometry (5th edition). Khanna Bandhu. Dehra Dun.
2. Forest Mensuration: A Handbook for Practitioners. 2006. Forestry Commission Publications.
3. Husch, B., Beers, T.W. and Kershaw, J. J.A. (2002). Forest Mensuration (4th edition). John Wiley & Sons, Nature.

**Reference Books:**

1. Laar, V. A. and Akca, A. (2007). Forest Mensuration. Managing Forest Ecosystems. Vol.13. Springer.
2. Manikandan, K. and Prabhu, S. (2012). Indian Forestry. Jain Brothers. New Delhi.
3. West, P.W. (2009). Tree and Forest Measurement (2nd edition). Springer.

| Paper I Major | Forest Mensuration Practical<br>L-T-P-C: 0-0-2-1 Credit Unit: 1 Evaluation Scheme: P | Course Code FOR142M311 |
|---|---|---|

**Course Objective:**
This course aims to provide students with foundational knowledge and practical skills in forest mensuration, including measurement techniques, growth analysis, and advanced applications essential for managing forest resources effectively.

**Course Outcome:**

| On successful completion of the course, the students will able to: | | Bloom's cognitive level |
|---|---|---|
| CO1 | Identify different methods and instruments used for measuring diameter, girth, height, and volume of trees. | BT3 |
| CO2 | Analyse the impact of measurement errors on forest management decisions and evaluate the effectiveness of various mensuration techniques in forest growth analysis. | BT 4 |

**Detailed Syllabus**

| Modules | Title of Unit and Contents | Hours |
|---|---|---|
| I | **Advanced Measurements and Practical Applications**<br>Practical Applications:<br>Calculation of volume of felled and standing trees.<br>Preparation of volume tables.<br>Application of different sampling methods.<br>Preparation of yield and stand tables.<br>Quantification of regeneration and stand establishment.<br>Measurement of crown density and crown ratios.<br>Crown profiling of trees and stands.<br>Dendrochronological studies. | 16 |
| | **Total** | 16 |

**Textbooks:**

1. Chaturvedi, A.N and L.S. Khanna (2011). Forest Mensuration and Biometry (5th edition). Khanna Bandhu. Dehra Dun.
2. Forest Mensuration: A Handbook for Practitioners. 2006. Forestry Commission Publications.
3. Husch, B., Beers, T.W. and Kershaw, J. J.A. (2002). Forest Mensuration (4th edition). John Wiley & Sons, Nature.

**Reference Books:**

1. Laar, V. A. and Akca, A. (2007). Forest Mensuration. Managing Forest Ecosystems. Vol.13. Springer.
2. Manikandan, K. and Prabhu, S. (2012). Indian Forestry. Jain Brothers. New Delhi.
3. West, P.W. (2009). Tree and Forest Measurement (2nd edition). Springer.

| Paper II Major | Silviculture & Nursery Technology<br>L-T-P-C:3-1-0-4 Credit Unit:4 Evaluation Scheme: T | Course Code FOR142M302 |
|---|---|---|

**Course Objective:** The course aims to provide students with a comprehensive understanding of forest nursery and regeneration techniques, including the principles of silviculture, nursery establishment, and advanced propagation methods.

**Course Outcome:**

| On successful completion of the course, the students will able to: | | Bloom's cognitive level |
|---|---|---|
| CO1 | Define key terms related to forestry, silviculture, and nursery management | BT 1 |
| CO2 | Explain the significance of site factors, tree growth patterns, and nursery establishment principles | BT 2 |
| CO3 | Utilize the ability to establish a forest nursery, including site selection, nursery layout, seed sowing, and the application of growth management techniques such as fertilization and root culturing. | BT 3 |
| CO4 | Examine various nursery techniques, and their advantages and disadvantages in different forest regeneration scenarios. | BT 4 |

**Detailed Syllabus**

| Modules | Title of Unit and Contents | Hours |
|---|---|---|
| I | **Introduction to Forestry and Regeneration**<br><br>Forests and Forestry: Definitions, significance, and overview of forestry.<br>Silviculture: Objectives, scope, and its relation with other branches of forestry.<br>Site Factors: Overview of climatic, edaphic, physiographic, biotic factors, and their interactions influencing forest sites.<br>Regeneration Techniques: Overview of natural and artificial regeneration; objectives, advantages, disadvantages, and factors influencing the choice of regeneration techniques. | 16 |
| II | **Forest Nursery Establishment and Management**<br><br>Introduction to Forest Nursery: Definition, scope, and significance of forest nurseries.<br>Nursery Establishment: Site selection, planning, and layout of nursery areas.<br>Types of Forest Nurseries: Different types and layouts, including nursery beds and preparation techniques.<br>Seed Sowing and Growth Management: Methods of seed sowing, mulching, seedling growth, development, and maintenance (pricking, weeding, hoeing, organic matter supplements). | 16 |
| III | **Containerized Nursery and Planting Techniques**<br><br>Containerized Nursery Techniques: Overview, type, and size of containers, merits and demerits of containerized nurseries.<br>Root Trainer Techniques: Detailed study of root trainer techniques and preparation of ingredient mixtures.<br>Planting Techniques: Techniques for planting containerized stock, bare-root seedlings, and handling methods for field planting.<br>Propagation Methods: Overview of vegetative propagation, including budding, grafting, and layering; miniclonal and microcutting technologies. | 16 |
| IV | **Nursery Pest and Disease Management**<br><br>Nursery Pests and Diseases: Identification of important nursery pests and diseases; control measures and management practices.<br>Modern Nursery Equipment and Tools: Introduction and identification of modern equipment and tools used in nurseries.<br>Advanced Nursery Operations: Preparation and planting of cuttings, pre-sowing seed treatments, and nursery practices for commercially important tree species. | 16 |

| | | |
|---|---|---|
| | Nursery Visits and Practical Applications: Visits to forest nurseries, hands-on experience with nursery practices, assessment of nursery conditions, and exposure to best practices in nursery management. | |
| | **Total** | 64 |

**Textbooks:**


1. Agrawal, R.L. (1986). Seed Technology. Oxford - IBH Publishing Co. New Delhi.
2. Bewely, J.D and Black, M. (1985). Seed- Physiology of development and germination.
3. Bose, T.K.; Mitra, S.K. and Sadhu, M.K. (1986). Propagation of tropical and sub-tropical Horticultural crops.NayaPrakash, Calcutta.
4. Chin, H.F. and Roberts, E.H. (1980). Recalcitrant Crop Seeds. Tropical Press Sdn. Bhd. Kuala Lumpur - 22-03, Malaysia.
5. Evans, J. and Turnbull, J.W. (2004). Plantation Forestry in the Tropics. 3rd edition. Oxford University Press.


**Reference Books:**


1. Hartmann, H.T. and Kester, D.E. (1968). Plant propagation – principles and practice prentice – Hall of India Private Limited, New Delhi.
2. ISTA (1993). International Rules for Seed Testing Rules. International Seed Testing Association, Zurich, Switzerland, 1993.
3. Khullar, P. et al. (1992). Forest Seed. ICFRE, New Forest, Dehra Dun.
4. Leadem, C.L. (1984). Quick Tests for Tree Seed Viability. B.C. Ministry of Forests and Lands, Canada.
5. Napier, I. and Robbins, M. (1989). Forest Seed and Nursery Practice in Nepal. Nepal-UK Forestry Research Project, Kathmandu.
6. 11. Prakash, R. (1990). Propagation Practices of Important Indian Trees. International Book Distributors, Dehra Dun.


| **Paper SEC** | **Geology & Soil science**<br><br>**L-T-P-C:2-0-0-2 Credit Unit:2 Evaluation Scheme: T** | **Course Code FOR142S301** |
|---|---|---|

**Course Objective:**

This course aims to introduce students to the fundamental concepts of soil science, including geology, soil formation, physical and chemical properties of soils, and measurement techniques.

**Course Outcome:**

| **On successful completion of the course, the students will able to:** | | **Bloom's cognitive level** |
|---|---|---|
| CO1 | Define key terms related to soil science, such as soil formation, physical and chemical properties, and types of soil water. | BT 1 |
| CO2 | Explain the processes of soil formation, the significance of soil properties like texture, structure, and porosity, and their influence on soil function. | BT 2 |
| CO3 | Identify different soil-forming minerals, weathering processes, and soil classification systems. | BT 3 |

**Detailed Syllabus**

| Modules | **Title of Unit and Contents** | **Hours** |
|---|---|---|
| I | **Introduction to Geology and Soil Formation**<br>Introduction to Geology: Definition, significance, and the composition of the earth's crust.<br>Soil as a Natural Body: Major components by volume; pedology, and rock types; Soil Forming Minerals: Definition, classification of minerals including silicates, oxides, carbonates, sulphides, and phosphates; their occurrence and importance in soil formation. | 16 |

| | | |
|---|---|---|
| | Weathering of Rocks and Minerals: Factors involved, weathering indices, and their impact on soil formation; Factors of Soil Formation: Parent material, climate, organisms, relief, and time; Soil Forming Processes: Eluviation, illuviation, and the formation of various soils.<br>Soil Classification: Elementary knowledge of soil classification, soil orders, forest soil characteristics, and their distinguishing features compared to agricultural soils. | |
| II | **Physical Properties of Soils**<br>Soil Texture: Definition, methods of textural analysis, Stokes' law, and use of the textural triangle; Specific Gravity: Absolute specific gravity, apparent specific gravity/bulk density, factors affecting them, and their relationship; Pore Space: Definition, factors affecting capillary and non-capillary porosity; Soil Colour: Significance, colour variables (hue, value, chroma), and use of Munsell colour chart; factors influencing soil colour including parent material, soil moisture, and organic matter; Soil Structure: Definition, classification, factors influencing soil structure genesis, and soil consistency; Soil Plasticity and Atterberg's Constants: Understanding soil plasticity, liquid limit, plastic limit, and shrinkage limit.<br>Soil Air and Temperature: Composition of soil air, factors influencing the amount of air space; sources and distribution of soil heat, factors affecting soil temperature, and measurement techniques. | 16 |
| III | **Chemical Properties of Soils**<br>Soil Colloids: Organic colloids (humus), inorganic colloids (secondary silicate clay, hydrous oxides), and their roles in soil properties; Soil Organic Matter: Decomposition process and impact on soil fertility; Soil pH: Concept, soil acidity, nutrient availability, and soil buffering capacity; Problematic Soils: Overview of saline, sodic, and calcareous soils, their characteristics, and management strategies; Study of soil profiles of various parts of India.<br>Importance of soil health on plant growth (humification, mineralization, decomposition etc). | 16 |
| | **Total** | 48 |

**Textbooks:**


1. Biswas, T.D. and Mukherjee, S. K. (1987). Test Book of Soil Science, Tata McGraw Hill Publishing Co., New Delhi
2. Weil, R.R. and Brady, N.C. (2017). The Nature and Properties of Soils. 15th edition. Pearson Education.
3. Brady, N. C. (1990). Nature and Properties of Soils. 10th ed., Macmillan Publishing Co. Inc. New York


**Reference Books:**


1. Foth, H.D. and Turk, L. M. (1972). Fundamental of Soil Science. 5th edn. Wiley Eastern Pvt.Ltd., New Delhi
2. Gupta, P.K. (2007). Soil, Plant, Water and Fertilizer Analysis. Published by AGROBIOS (India), Jodhpur
3. Indian society of soil science (ISSS). (2002). Fundamentals of Soil Science. Published by Indian Society of Soil Science, IARI, New Delhi
4. Indian Society of Soil Science (ISSS). (2015) Fundamental of Soil Science. 2nd Edition. Indian Society of Soil Science, IARI, New Delhi.


| **Paper SEC** | **Geology & Soil science Practical**<br><br>**L-T-P-C:0-0-2-1 Credit Unit:1 Evaluation Scheme: P** | **Course Code FOR142S311** |
|---|---|---|

**Course Objective:**

This course aims to introduce students to the fundamental concepts of soil science, including geology, soil formation, physical and chemical properties of soils, and measurement techniques.

**Course Outcome:**

| On successful completion of the course, the students will able to: | | Bloom's cognitive level |
|---|---|---|
| CO1 | Apply measurement techniques to analyse soil properties, including texture, pH, and water content, using laboratory and field methods. | BT 4 |

**Detailed Syllabus**

| Modules | Title of Unit and Contents | Hours |
|---|---|---|
| I | **Soil Water and Practical Applications**<br>**S**oil Water: Forms of soil water, soil moisture content, hygroscopic coefficient, wilting point, field capacity, moisture equivalent, and maximum water holding capacity.<br>Energy Concepts and Soil Water Measurement: pF scale, gravimetric methods, electric methods, tensiometer, pressure plate, and pressure membrane apparatus; use of neutron probes.<br>Soil Water Movement: Understanding saturated and unsaturated flow, infiltration, and percolation.<br>Practical Applications: Mechanical analysis of soil; Determination of pH, organic carbon (C), cation exchange capacity (CEC); Analysis of available micro and macro nutrients.<br>Formulating manurial schedules for different soil types. | 12 |
| | **Total** | 12 |

**Textbooks:**

1. Biswas, T.D. and Mukherjee, S. K. (1987). Test Book of Soil Science, Tata McGraw Hill Publishing Co., New Delhi
2. Weil, R.R. and Brady, N.C. (2017). The Nature and Properties of Soils. 15th edition. Pearson Education.
3. Brady, N. C. (1990). Nature and Properties of Soils. 10th ed., Macmillan Publishing Co. Inc. New York

**Reference Books:**

1. Foth, H.D. and Turk, L. M. (1972). Fundamental of Soil Science. 5th edn. Wiley Eastern Pvt.Ltd., New Delhi
2. 5. Gupta, P.K. (2007). Soil, Plant, Water and Fertilizer Analysis. Published by AGROBIOS (India), Jodhpur
3. 6. Indian society of soil science (ISSS). (2002). Fundamentals of Soil Science. Published by Indian Society of Soil Science, IARI, New Delhi
4. 7. Indian Society of Soil Science (ISSS). (2015) Fundamental of Soil Science. 2nd Edition. Indian Society of Soil Science, IARI, New Delhi.

| Paper Minor | Forest Protection<br>L-T-P-C: 3-1-0-4 Credit Unit:4 Evaluation Scheme: T | Course Code FOR142N301 |
|---|---|---|

**Course Objective:**

This course aims to provide students with comprehensive knowledge and skills in forest protection, focusing on the impact of forest fires, human activities, weeds, diseases, and pests on forest ecosystems.

**Course Outcome:**

| On successful completion of the course, the students will able to: | | Bloom's cognitive level |
|---|---|---|
| CO1 | Explain the importance of forest protection and forest pathology, including the classification of tree diseases, their causes, symptoms, and impact on forest health. | BT 1&2 |
| CO2 | Identify and assess injuries caused by human activities such as lopping, cutting for fuel wood, and different forms of forest encroachment. | BT 3 |
| CO3 | Examine the factors leading to pest outbreaks and methods of pest control, including silvicultural, legal, biological, and chemical approaches. | BT 4 |

**Detailed Syllabus**

| Modules | **Title of Unit and Contents** | **Hours** |
|---|---|---|
| I | **Human Activities in Forests**<br>Damage by Humans: Cutting trees and using forest land harms forests.<br>Illegal Activities: Encroachment and illegal tree cutting are controlled by laws.<br>Live Fencing: Using plants like Caesalpiniabonduc as fences. | 16 |
| II | **Forest Fires – Control**<br>Introduction: Protecting forests from fires is important.<br>Causes: Fires are caused by nature or human activities.<br>Prevention and Control: Prevent fires and use equipment to fight them. | 16 |
| III | **Weed and Disease Management**<br>Forest Weeds: Weeds and climbers damage forests and need to be managed.<br>Tree Diseases: Diseases harm trees; they need to be identified and controlled. | 16 |
| IV | **Forest Entomology**<br>Forest Pests: Insects damage trees.<br>Pest Control: Use methods like biological control and chemicals to manage pests. | 16 |
| | **Total** | 64 |

**Textbooks:**


1. Tainter, F.H. and Baker, F.A. (1996). Principles of Forest Pathology. John Wiley & Sons, New York, USA.
2. Paul, D. M. (1990). Tree Disease Concepts. Prentice-hall, Inc. New Jersey.
3. Wayne, S. and Howard, H.L. (2005). Diseases of Trees and Shrubs, 2nd edition, Comstock Publishing Associates.
4. Horst, R. Kenneth (2013). Field Manual of Diseases on Trees and Shrubs, Springer Netherlands.


**Reference Books:**


1. Luna, R.K. (2007). Principles and Practices of Forest Fire Control. International Book Distributors, Dehradun.
2. Negi, S.S. (1999). Handbook of Forest Protection. International Book Distributors.
3. Pathak, V.N., Khatri, N.K. and Pathak, M. (2000). Fundamentals of Plant Pathology. Eds. Agribios (India), Jodpur.
4. Singh, R.S. (2002). Introduction Principles of Plant Pathology. Oxford & IBH, New Delhi.


| **Paper**<br>**AEC** | **Fundamentals of Business Communication**<br><br>**L-T-P-C: 1-0-0-1 Credit Unit: 1 Evaluation Scheme: T** | **Course Code**<br>**CEN982A301** |
|---|---|---|

**Course Objective:** The aim of the course is to develop essential business communication skills, including effective writing, speaking, and interpersonal communication, to enhance professional interactions, collaboration, and successful communication strategies within diverse corporate environments.

**Course Outcomes:** On successful completion of the course the students will be able to:

| CO Level | Course Outcome | Blooms Taxonomy Level |
|---|---|---|
| CO 1 | **Define and list** business documents using appropriate formats and styles, demonstrating proficiency in written communication for various business contexts. | BT 1 |
| CO 2 | **Demonstrate** confident verbal communication skills through persuasive presentations, active listening, and clear articulation to engage and influence diverse stakeholders. | BT 2 |
| CO 3 | **Apply** effective interpersonal communication strategies, including conflict resolution and active teamwork, to foster positive relationships and contribute to successful organizational communication dynamics | BT 3 |

| Detailed Syllabus | | |
|---|---|---|
| **Units** | **Course Contents** | **Periods** |
| I | **Business Communication: Spoken and Written**<br>• The Role of Business Communication<br>• Classification and Purpose of Business Communication<br>• The Importance of Communication in Management<br>• Communication Training for Managers<br>• Communication Structures in Organizations<br>• Information to be Communicated at the Workplace<br>• Writing Business Letters, Notice, Agenda and Minutes | 5 |
| II | **Negotiation Skills in Business Communication**<br>• The Nature and Need for Negotiation<br>  ○ Situations requiring and not requiring negotiations<br>• Factors Affecting Negotiation<br>  ○ Location, Timing, Subjective Factors<br>• Stages in the Negotiation Process<br>  ○ Preparation, Negotiation, Implementation<br>• Negotiation Strategies | 5 |
| III | **Ethics in Business Communication**<br>• Ethical Communication<br>• Values, Ethics and Communication<br>• Ethical Dilemmas Facing Managers<br>• A Strategic Approach to Business Ethics<br>• Ethical Communication on the Internet<br>• Ethics in Advertising | 5 |

| | | |
|---|---|---|
| **IV** | **Business Etiquettes and Professionalism**<br>• Introduction to Business Etiquette<br>• Interview Etiquette<br>• Social Etiquette<br>• Workplace Etiquette<br>• Netiquette | **5** |

**Texts:**

1. *Business Communication* by Shalini Verma
2. *Business Communication* by P.D. Chaturvedi and Mukesh Chaturvedi
3. *Technical Communication* by Meenakshi Raman and Sangeeta Sharma

| **Paper AEC** | **Behavioural Sciences -III**<br>**L-T-P-C: 1-0-0-1 Credit Unit: 1 Evaluation Scheme: T** | **Course Code BHS982A304** |
|---|---|---|

**Course objectives:** To increase one's ability to draw conclusions and develop inferences about attitudes and behaviour, when confronted with different situations that are common in modern organizations .To enable the students to understand the process of problem solving and creative thinking.

**Course outcomes:** On completion of the course the students will be able to:

CO1: Understand the process of problem solving and creative thinking.

CO2: Develop and enhance of skills required for decision-making.

| Modules | Course Contents | Periods |
|---|---|---|
| I | **Problem Solving Process**<br>Defining problem, the process of problem solving, Barriers to problem solving(Perception, Expression, Emotions, Intellect ,surrounding environment) | 4 |
| II | **Thinking as a tool for Problem Solving**<br>What is thinking: The Mind/Brain/Behaviour Critical Thinking and Learning:<br>-Making Predictions and Reasoning.<br>-Memory and Critical Thinking.<br>- Emotions and Critical Thinking. | 4 |
| III | **Creative Thinking**<br>- Definition and meaning of creativity,<br>- The nature of creative thinking :Convergent and Divergent thinking,<br>- Idea generation and evaluation (Brain Storming)<br>- Image generation and evaluation.<br>- The six-phase model of Creative Thinking: ICEDIP model | 4 |
| IV | **Building Emotional Competence**<br>Emotional Intelligence – Meaning,<br>components, Importance and Relevance<br>Positive and Negative emotions<br>Healthy and Unhealthy expression of emotions | 4 |
| **Total** | | **16** |

**Text books:**

• J William Pfeiffer (ed.) Theories and Models in Applied Behavioural Science, Vol 3, Management; Pfeiffer &Company

• Blair J. Kolasa, Introduction to Behavioural Science for Business, John Wiley & Sons Inc.

## B. Sc. Course in Forestry: Semester-IV

| Paper Major | Principles of Agroforestry<br><br>L-T-P-C:2-1-0-3 Credit Unit: 3 Evaluation Scheme: T | Course Code FOR142M401 |
|---|---|---|

**Course Objective:** To provide students with a comprehensive understanding of sustainable agriculture and agroforestry principles, enabling them to analyse and apply various agroforestry practices to enhance biodiversity, improve land use management, and promote sustainable resource utilization.

**Course Outcome:**

| On successful completion of the course, the students will able to: | | Bloom's cognitive level |
|---|---|---|
| CO1 | Define key concepts related to sustainable agriculture and agroforestry, including agrobiodiversity, nutrient cycling, and tree-crop interactions. | BT 1 |
| CO2 | Explain the significance of agroforestry in addressing the demands for fuelwood, fodder, and timber, as well as its ecological and economic benefits. | BT 2 |
| CO3 | Demonstrate the ability to assess tree-crop interactions and apply management practices to enhance positive interactions while minimizing negative effects in agroforestry systems. | BT 3 |
| CO4 | Analyse the interactions between trees and crops in agroforestry systems, assessing their effects on nutrient management, productivity, and ecological sustainability. | BT 4 |

**Detailed Syllabus**

| Modules | Title of Unit and Contents | Hours |
|---|---|---|
| I | **Introduction to Sustainable Agriculture**<br>Overview of the agricultural scenario, its structure, and constraints<br>Concept of sustainable agriculture and land use management<br>Paradigm shift in agricultural development and impacts of the Green Revolution; Agrobiodiversity: significance, threats, and conservation strategies | 16 |
| II | **Fundamentals of Agroforestry**<br>Definition and scope of agroforestry; Rising demands for fuelwood, fodder, and timber; Social, ecological, and economic reasons for agroforestry; Historical development of agroforestry<br>Classification of agroforestry systems; Components of agroforestry and their provisioning and regulatory services<br>Carbon credit, Green credits, socio-economic valuation and economics parts, sustainable agroforestry | 16 |
| III | **Interactions and Nutrient Management in Agroforestry**<br>Nutrient cycling and soil improvement; Increased production and productivity in agroforestry systems; Microclimate amelioration and carbon sequestration; Tree-crop interactions: Definition and types of interactions (positive and negative)<br>Concepts of complementarity, compatibility, mutualism, and commensalism; Negative interactions: allelopathy and competition<br>Management of interactions: aboveground and belowground interactions, manipulation of density, space, crown, and roots<br>Nursery management and Quality Planting material | 16 |
| IV | **Tree Management and Crop Planning in Agroforestry**<br>Structure and growth of trees, crown and root architecture<br>Agroforestry practices to minimize negative interactions: coppicing, thinning, pollarding, and pruning; Crop planning and management: | 16 |

| | | |
|---|---|---|
| | Selection of suitable crops; Management of nutrients, water, and weeds; National Agroforestry Policy 2014 and relevant national and international organizations in agroforestry<br>Visit agroforestry sites with different crop combinations; Harvesting and marketing of agroforestry produce; Visits to traditional multistoried homestead gardens, commercial agroforestry plantations, and food forests | |
| | **Total** | 64 |

**Textbooks:**


1. Tejwani, K. G. (2002). *Agro forestry in India*. Concept Publishing Company.
2. Nair, P. R., Kumar, B. M., & Nair, V. D. (2021). An introduction to agroforestry: four decades of scientific developments (pp. 3-20). Cham: Springer.


**Reference Books:**


1. Nair, P.K.R., Kumar, B.M. and Vimala D. N. (2009). Agroforestry as a strategy for carbon sequestration. J. Plant Nutr. Soil Sci. 172: 10–23.
2. Atangana, A., Khasa, D., Chang, S., Degrande, A., Atangana, A., Khasa, D., ... &Degrande, A. (2014). Definitions and classification of agroforestry systems. Tropical agroforestry, 35-47.


| **Paper II Major** | **Forest Management**<br><br>**L-T-P-C: 2-1-0-3 Credit Unit: 3 Evaluation Scheme: T** | **Course Code FOR142M402** |
|---|---|---|

**Course Objective:** To equip students with a comprehensive understanding of the principles and practices of forest management, including the concepts of sustainable forestry, community involvement, and operational techniques, enabling them to effectively contribute to forest conservation and management in diverse ecological and social contexts.

**Course Outcome:**

| **On successful completion of the course, the students will able to:** | | **Bloom's cognitive level** |
|---|---|---|
| CO1 | Define key concepts related to forest management, including sustained yield, sustainable forest management, and community forestry. | BT 1 |
| CO2 | Explain the principles of sustainable forest management and the significance of community involvement in forestry practices. | BT 2 |
| CO3 | Apply the principles of forest management to analyse case studies, demonstrating how various management techniques can be implemented in real-world scenarios. | BT 3 |
| CO4 | Evaluate different forest management strategies and their effectiveness in achieving sustainable yields and community benefits, identifying potential challenges and areas for improvement. | BT 4 |

**Detailed Syllabus**

| Modules | **Title of Unit and Contents** | **Hours** |
|---|---|---|
| I | **Fundamentals of Forest Management**<br>Definitions, Scope, Objectives, and Principles of Forest Management: Understanding the fundamental concepts and organizational structure of state forests.<br>Sustained Yield: Definition, principles, and limitations of sustained yield forestry.<br>Sustainable Forest Management: Criteria and indicators of sustainability; increasing and progressive yields.<br>Rotation: Definitions, various types of rotations, determining rotation length, and factors influencing the choice of rotation. | 16 |

| | | |
|---|---|---|
| | Tools for sustainable forest management -Forest certification, Trees outside Forest (ToF) standard rules, International Guidelines for Sustainable Forest Management | |
| II | **Concepts of Normal Forest and Working Plans**<br>Normal Forest: Definitions, basic factors of normality, and factors governing the yield and growth of forest stands.<br>Working Plan: Preparation, objectives, and uses of working plans in forestry; the role of forest maps.<br>Modern Tools in Forest Management: Introduction to modern tools and techniques used in managing forests.<br>Joint Forest Management (JFM): Concept, principles, and its role in participatory forest management. | 16 |
| III | **Community Forestry and Social Forestry**<br>Forestry as a Common Property Resource: Definition, scope, and necessity of community forestry; integration of forestry with agriculture, animal husbandry, and horticulture.<br>Importance of community involvement in forest conservation; the role of NGOs, civil societies, and citizen groups in community forest management.<br>Social Forestry: Definition, objectives, and significance as outlined in the NCA report of 1976; the role of social forestry in rural development, including fodder, fuelwood, and timber production. | 16 |
| IV | **Integrated Rural Development and Operational Techniques**<br>Community Forest Development: Social, economic, and environmental aspects; community mobilization approach to forest conservation and management.<br>Integrated Rural Development Approach: Role of forestry in rural livelihoods, Role of Government Departments/Ministries in rural livelihood, alternate employment generation, and the importance of proper marketing facilities.<br>Operational Techniques in Forest Management: Case analysis using forest inventories, operational research methods, and simulation modeling for forest operations and processing facilities. | 16 |
| | **Total** | 64 |

**Textbooks:**

1. BalaKathiresan, S. (1986). Essentials of Forest Management, Nataraj Publishers, Dehradun.
2. Bhattacharya, P., Kandya A.K. and Kumar, K. (2008). Joint Forest Management in India, Aavishkar Publisher, Jaipur.
3. Desai, V. (1991). Forest Management in India– Issues and Problems. Himalaya Publisher House, Bombay.

**Reference Books:**

1. Edmunds, D. and Wollenberg, E. (2003). Essentials of Forest Management. Natraj Publishers, Dehradun.
2. Jerome, L.C. (1983). Timber Management: A Quantitative Approach. John Wiley and Sons.
3. National Working Plan Code. (2014). MoEF, New Delhi.
4. Prakash, R. (1986). Forest Management. IBD, Dehradun, India.
5. Recknagel, A.B. and Bentley. J. (1988). Forest Management. IBD, Dehradun.
6. Trivedi, P.R. and Sudarshan, K.N. (1996). Forest Management. Discovery publications, New Delhi.

| Paper III Major | Forest Resources Utilization<br><br>L-T-P-C:2-0-0-2 Credit Unit:2 Evaluation Scheme: T | Course Code FOR142M403 |
|---|---|---|

**Course Objective:** To provide students with a comprehensive understanding of the significance of wood and wood-based industries in the Indian economy, including the methods of wood modification, the utilization of lesser-known forest species, and the cultivation and extraction practices of medicinal and aromatic plants.

**Course Outcome:**

| On successful completion of the course, the students will able to: | | Bloom's cognitive level |
|---|---|---|
| CO1 | Define and describe the various uses of wood and the types of wood-based industries in India, including their significance in the economy. | BT 1 |
| CO2 | Explain the processes involved in wood modification and the characteristics of different forest-based industries, such as pulp and paper, furniture, and composite wood. | BT 2 |

**Detailed Syllabus**

| Modules | Title of Unit and Contents | Hours |
|---|---|---|
| I | **Introduction to Wood and Forest-Based Industries**<br>Overview of wood uses and the growth of the wood-based industry in India; Impact of globalization on the wood industry; Importance of forest-based industries in the Indian economy; Wood as a source of energy and chemicals; Role of wood as raw material in industries like pulp, paper, rayon, composite woods, and improved woods. | 16 |
| II | **Types of Forest-Based Industries**<br>Description of various forest-based industries: Paper and pulp industry; Furniture manufacturing; Bamboo processing.<br>Production of sports goods, pencil-making, matchbox, and splint-making; Utilization of lesser-known forest species for commercial purposes; Structural uses of timber, including bridges and superstructures; Decorative applications of wood. | 16 |
| III | **Wood Modification and Composite Wood**<br>Introduction to wood modification: need and scope.<br>Chemical modification of wood (acetylation, reaction with isocyanates, etc.); Primary conversion processes: sawing and veneering; Manufacturing processes, properties, and uses of:Composite wood, plywood, laminated wood, core board, sandwich board, fibre board, and particle board; Adhesives used in the manufacture of composite wood; Overview of improved wood, compressed wood, and impregnated wood. | 16 |
| | **Total** | 48 |

**Textbooks:**


1. Atul, C.K. and Kapur, B.K. (1982). Cultivation and utilization of medicinal plants. RRL, CSIR, Jammu-Tawi.
2. Chopra, R.N., Nayar, S.L. and Chopra, I.C. (1956). Glossary of Indian medicinal plants. CSIR, New Delhi.
3. Cunningham, A. (2014). Applied Ethnobotany: "People, Wild Plant Use and Conservation". Taylor & Francis


**Reference Books:**


1. EIRI Board. (2007). Handbook of Medicinal and Aromatic Plants: Cultivation, Utilisation and Extraction
2. Jain, S.K. (2010). Manual of Ethnobotany (2nd Ed). Scientific Publishers, India.

| Paper III Major | Forest Resources Utilization Practical<br><br>L-T-P-C:0-0-2-1 Credit Unit:1 Evaluation Scheme: P | Course Code FOR142M413 |
|---|---|---|

**Course Objective:** To provide students with a comprehensive understanding of the significance of wood and wood-based industries in the Indian economy, including the methods of wood modification, the utilization of lesser-known forest species, and the cultivation and extraction practices of medicinal and aromatic plants.

**Course Outcome:**

| On successful completion of the course, the students will able to: | | Bloom's cognitive level |
|---|---|---|
| CO1 | Demonstrate the methods of cultivation and extraction of essential oils from selected medicinal and aromatic plants, including the identification and classification of these species. | BT 3 |
| CO2 | Analyse the impact of globalization on the growth of wood-based industries in India and evaluate the economic significance of medicinal and aromatic plants, considering their potential for conservation and sustainable use. | BT 4 |

**Detailed Syllabus**

| Modules | Title of Unit and Contents | Hours |
|---|---|---|
| I | **Importance of Animal/wildlife in forest resource utilization**<br>**Practical Component:** Exposure to wood seasoning and preservation techniques; Determination of wood physical and mechanical properties; Practical sessions on wood histology.<br>Field execution and identification of relevant plant species.<br>Nursery techniques for 20 species (3 tropical, 3 sub-tropical).<br>Visits to timber depots, sawmills, NeDFI, and other related organizations. | 16 |
| | **Total** | 16 |

**Textbooks:**

1. Atul, C.K. and Kapur, B.K. (1982). Cultivation and utilization of medicinal plants. RRL, CSIR, Jammu-Tawi.
2. Chopra, R.N., Nayar, S.L. and Chopra, I.C. (1956). Glossary of Indian medicinal plants. CSIR, New Delhi.
3. Cunningham, A. (2014). Applied Ethnobotany: "People, Wild Plant Use and Conservation". Taylor & Francis

**Reference Books:**

1. EIRI Board. (2007). Handbook of Medicinal and Aromatic Plants: Cultivation, Utilisation and Extraction
2. Jain, S.K. (2010). Manual of Ethnobotany (2nd Ed). Scientific Publishers, India.

| Paper IKS | Indigenous Practices in Forestry and Sustainable Resource Management<br><br>L-T-P-C:2-1-0-3 Credit Unit: 3 Evaluation Scheme: T | Course Code FOR142M404 |
|---|---|---|

**Course Objective:** The objective of this course is to provide students with an understanding of Indian Knowledge Systems (IKS) in forestry and forest products, focusing on traditional ecological practices, bio-resource use, and indigenous healthcare systems, and their role in sustainable forest management and conservation.

**Course Outcome:**

| On successful completion of the course, the students will able to: | Bloom's cognitive level |
|---|---|

| | | |
|---|---|---|
| CO1 | Recall traditional practices of forest conservation, sacred groves, and spiritual practices. | BT 1 |
| CO2 | Explain the role of myths, rituals, and taboos in sustainable forest management and resource conservation. | BT 2 |
| CO3 | Apply indigenous methods of dye extraction and wood processing in practical situations. | BT 3 |
| CO4 | Compare and contrast traditional ecological knowledge with modern forestry practices to evaluate their sustainability.. | BT 4 |

**Detailed Syllabus**

| Modules | **Title of Unit and Contents** | **Hours** |
|---|---|---|
| I | **Indigenous Belief Systems and Forest Conservation**<br>Role of beliefs and taboos in forest conservation; Conservation linked to sacred groves and water bodies; Folk Narratives and Ecological Knowledge: Stories, songs, dances, and proverbs reflecting forest wisdom; Traditional Forest Narratives: Plays, acts, and their role in cultural transmission of ecological knowledge.<br>Symbolism of animals in indigenous belief systems and rituals<br>Traditional Conflict Mitigation Strategies-Use of live fences (e.g., *Caesalpiniabonduc*), buffer zones, and sustainable hunting practices. | 16 |
| II | **Indigenous Practices in Agriculture and Resource Management**<br>Sustainable practices in agriculture and livestock management; Spiritual and cultural methods for conserving forests and water; Techniques for maintaining soil health and resource management. | 16 |
| III | **Bio-resource Utilization and Handicrafts**<br>Traditional methods of resource utilization and food storage; Indigenous techniques in wood carving, fiber extraction, and costume creation; Extraction and use of plant fibers in everyday life. | 16 |
| IV | **Traditional Healthcare and Dyeing Techniques**<br>Vaidya, Tantra-Mantra, and Amchi medicine; Spiritual Healing Practices: Connection between spiritual beliefs and forest resources; Chemistry of natural dyes and traditional dyeing methods; Traditional knowledge of dye-making and wood carving techniques. | 16 |
| | **Total** | 64 |

**Textbooks:**


3. Huxley, P. (1999). Tropical Agroforestry. Wiley.
4. Kumar, B.M. and Nair, P.K.R (eds). (2011). Carbon Sequestration Potential of Agroforestry Systems: Opportunities and challenges. Advances in Agroforestry 8. Springer Science, The Netherlands.


**Reference Books:**


3. Nair, P.K.R., Kumar, B.M. and Vimala D. N. (2009). Agroforestry as a strategy for carbon sequestration. J. Plant Nutr. Soil Sci. 172: 10–23.
4. Pathak, P.S. and Newaj, R. (eds.) (2003). Agroforestry: Potentials and Opportunities. Agrobios, Jodhpur.


| **Paper Minor** | **Wildlife Biology**<br>**L-T-P-C: 3-1-0-4 Credit Unit:4 Evaluation Scheme: T** | **Course Code FOR142N401** |
|---|---|---|

**Course Objective:**

This course aims to provide students with a comprehensive understanding of wildlife conservation, management, and ecology. It covers the causes of wildlife depletion, conservation needs, species identification, wildlife management techniques, and census methods.

**Course Outcome:**

| **On successful completion of the course, the students will able to:** | **Bloom's cognitive level** |
|---|---|

| | | |
|---|---|---|
| CO1 | Define key concepts of wildlife, including the causes of wildlife depletion and the need for conservation. | BT 1 |
| CO2 | Explain the impact of biotic factors, light, and temperature on wildlife and the principles underlying wildlife ecology and management. | BT 2 |
| CO3 | Apply vegetative analysis methods and use GIS and remote sensing tools for wildlife habitat surveys and management. | BT 3 |
| CO4 | Analyze the factors contributing to wildlife depletion and assess the effectiveness of current conservation strategies | BT 4 |

**Detailed Syllabus**

| Modules | **Title of Unit and Contents** | **Hours** |
|---|---|---|
| I | **Introduction to wildlife**<br>Wildlife: Definition and scope; Causes of wildlife depletion, need for wildlife conservation.<br>Values of Wildlife: Ethical, cultural, scientific, economical, aesthetic and negative values.<br>Rare, endangered, threatened and endemic species of fishes, amphibians, reptiles, birds and mammals in India. | 16 |
| II | **Wildlife ecology**<br>Biotic factors, biological basis of wildlife, productivity.<br>Effect of light and temperature on animals; Zoogeographical regions (Animal Distribution).<br>Basic requirements of wildlife: food, water, shelter, space, limiting factors. | 16 |
| III | **Wildlife - conservation**<br>In-situ and ex-situ conservation: definition, formation, management andadministration of Wildlife Sanctuaries, National Parks, Tiger Reserves and Biosphere Reserves.<br>Wildlife Projects: Tiger, Elephant, Lion and HanSgul; Zoos<br>Captive breeding: aims, principles, methods; role of Government and Non-Governmental Organizations in conservation. | 16 |
| IV | **Wildlife management**<br>Vegetative analyses – Point Centered Quadrat, Quadrat, Strip transect.<br>GIS and Remote sensing in wildlife habitat survey; Habitat manipulation: food, water, shade improvement; impact and removal of invasive alien species. | 16 |
| | **Total** | 64 |

**Textbooks:**


1. Silvy, N. J. (Ed.). (2020). The Wildlife Techniques Manual: Volume 1: Research. Volume 2: Management. JHU Press.
2. Krausman, P. R., & Cain, J. W. (Eds.). (2022). *Wildlife management and conservation: contemporary principles and practices*. JHU Press.


**Reference Books:**


1. Mills, L. S. 2013. Conservation of Wildlife Populations Demography, Genetics and Management. Wiley-Blackwell, New Jersey, USA
2. Sawarkar, B. 2005. Wildlife Management. Wildlife Institute of India. Dehradun.
3. Wildlife Institute of India (2004) Compendium on the notes on the course Captive management of Endangered Species. Wildlife Institute of India. Dehradun.

| Paper Minor | Forest Ecology and Biodiversity Conservation<br><br>L-T-P-C: 3-1-0-4 Credit Unit:4 Evaluation Scheme: T | Course Code FOR142N402 |
|---|---|---|

**Course Objective:**

To introduce students to the fundamental principles of forest ecology and biodiversity conservation, emphasizing the structure, function, and sustainable management of forest ecosystems, along with the strategies for conserving biodiversity.

**Course Outcome:**

| On successful completion of the course, the students will able to: | | Bloom's cognitive level |
|---|---|---|
| CO1 | Recall the basic concepts of forest ecosystems, including types of forests and their ecological significance. | BT 1 |
| CO2 | Explain the importance of biodiversity within forest ecosystems and identify key threats to forest biodiversity. | BT 2 |
| CO3 | Apply conservation strategies, such as sustainable forest management and biodiversity protection, to case studies or real-world scenarios. | BT 3 |
| CO4 | Analyse the role of forests in climate change mitigation and assess the impact of afforestation and reforestation efforts. | BT 4 |

**Detailed Syllabus**

| Modules | Title of Unit and Contents | Hours |
|---|---|---|
| I | **Introduction to Forest Ecology**<br>Overview of forest ecosystems and their role in the environment.<br>Types of Forests: Tropical, temperate, boreal, and their global distribution.<br>Forest Structure and Function: Canopy layers, nutrient cycling, and energy flow in forests. | 16 |
| II | **Forest Biodiversity**<br>Biodiversity Concepts: Species, genetic, and ecosystem diversity in forests.<br>Importance of Forest Biodiversity: Ecological, economic, and social benefits.<br>Threats to Biodiversity: Habitat loss, deforestation, invasive species, and climate change. | 16 |
| III | **Conservation of Forest Ecosystems**<br>Conservation Strategies: In-situ (protected areas, national parks) and ex-situ (seed banks, botanical gardens).<br>Sustainable Forest Management: Community forestry, agroforestry, and responsible logging practices.<br>Conservation Policies and Legislation: National and international frameworks (e.g., CBD, REDD+). | 16 |
| IV | **Role of Forests in Climate Change Mitigation**<br>Forests as Carbon Sinks: Role in reducing carbon dioxide in the atmosphere.<br>Afforestation and Reforestation: Methods and benefits.<br>Forest Restoration Initiatives: Examples of global and local efforts to restore degraded forest ecosystems. | 16 |
| | **Total** | 64 |

**Textbooks:**


1. Singh, M. P., Singh, J. K., & Mohanka, R. (2007). Forest environment and biodiversity. Daya Books.
2. Montagnini, F., & Jordan, C. F. (2005). Tropical forest ecology: the basis for conservation and management (Vol. 25275211). Berlin: Springer.

**Reference Books:**


1. Newton, A. (2007). Forest ecology and conservation: a handbook of techniques. Oxford University Press, USA.
2. Shukla, G., & Chakravarty, S. (2017). Forest Ecology and Conservation. InTech.


| Paper AEC | Business Communication: Concepts and Skills<br><br>L-T-P-C: 1-0-0-1 Credit Unit: 1 Evaluation Scheme: T | Course Code CEN982A401 |
|---|---|---|

**Course Objectives:** This course is designed to enhance employability and maximize the students' potential by introducing them to the principles that determine personal and professional success, thereby helping them acquire the skills needed to apply these principles in their lives and careers.

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

| CO Level | Course Outcome | Blooms Taxonomy Level |
|---|---|---|
| CO 2 | **Demonstrate** understanding the importance of verbal and non-verbal skills while delivering an effective presentation. | BT 2 |
| CO 3 | **Develop** professional documents to meet the objectives of the workplace | BT 3 |
| CO 3 | **Identify** different life skills and internet competencies required in personal and professional life. | BT 3 |

| Detailed Syllabus | | |
|---|---|---|
| **Units** | **Course Contents** | **Periods** |
| I | **Presentation Skills**<br>Importance of presentation skills, Essential characteristics of a good presentation, Stages of a presentation, Visual aids in presentation, Effective delivery of a presentation | 5 |
| II | **Business Writing**<br>Report writing: Importance of reports, Types of reports, Format of reports, Structure of formal reports<br>Proposal writing: Importance of proposal, Types of proposal, structure of formal proposals<br>Technical articles: Types and structure | 5 |

| | | |
|---|---|---|
| **III** | **Preparing for jobs**<br>Employability and Unemployability, Bridging the Industry-Academia Gap Knowing the four- step employment process, writing resumes, Guidelines for a good resume, Writing cover letters<br>Interviews: Types of interview, what does a job interview assess, strategies of success at interviews, participating in group discussions. | **5** |
| **IV** | **Digital Literacy and Life Skills**<br>**Digital literacy:** Digital skills for the '21st century', College students and technology, information management using Webspace, Dropbox, directory, and folder renaming conventions. Social Media Technology and Safety, Web 2.0.<br>**Life Skills**: Overview of Life Skills: Meaning and significance of life skills, Life skills identified by WHO: self-awareness, Empathy, Critical thinking, Creative thinking, Decision making, problem- solving, Effective communication, interpersonal relationship, coping with stress, coping with emotion.<br>Application of life skills: opening and operating bank accounts, applying for PAN, Passport, online bill payments, ticket booking, gas booking | **5** |

**Texts:**


1. *Business Communication* by Shalini Verma References:
2. *Technical Communication* by Meenakshi Raman and Sangeeta Sharma


| **Credit Distribution** | | |
|---|---|---|
| **Lecture/Tutorial** | **Practicum** | **Experiential Learning** |
| 15 hours | - | 10 hours<br>- Movie/ Documentary screening<br>- Field visits<br>- Peer teaching<br>- Seminars<br>- Library visits |

## B. Sc. Course in Forestry: Semester-V

| Paper I Major | Forest Policy and Legislation<br><br>L-T-P-C: 3-1-0-4 Credit Unit: 4 Evaluation Scheme: T | Course Code FOR142M501 |
|---|---|---|

**Course Objective:**

This course aims to provide students with the knowledge on various policies and acts related to forests

**Course Outcome:**

| On successful completion of the course, the students will able to: | | Bloom's cognitive level |
|---|---|---|
| CO1 | Recall the fundamental concepts of forest policies, legal frameworks, and governance structures related to forestry in India. | BT 1 |
| CO2 | Explain the evolution of National Forest Policies (1894, 1952, and 1988) and their impact on forest conservation, management, and community rights. | BT 2 |
| CO3 | Apply knowledge of forestry laws to real-world forestry governance and conservation scenarios. | BT 3 |
| CO4 | Analyze the constraints in implementing forest policies and laws, assess their effectiveness, and suggest improvements for sustainable forest management. | BT 4 |

**Detailed Syllabus**

| Modules | Title of Unit and Contents | Hours |
|---|---|---|
| I | **Forest Policy and Governance**<br>Necessity of a Forest Policy – Importance, objectives, and principles.<br>General Basis of Formulation – Ecological, economic, social, and legal considerations.<br>Comparative Study of National Forest Policies –<br>National Forest Policy of 1894, 1952, and 1988<br>Basis of their formulation and their aftereffects<br>Constraints in the Implementation of Forest Policy in India<br>Need-Based Law for Policy Implementation | 16 |
| II | **National and State Forestry Action Programs**<br>National Forestry Action Program (NFAP) – Objectives, formulation, and implementation constraints.<br>State Forestry Action Programs (SFAPs) – Variations and effectiveness.<br>Forest Law – Legal Definition and Scope<br>Indian Forest Act, 1927 – Detailed study of provisions and amendments.<br>Forest (Conservation) Act, 1980 – Key provisions, amendments, and impacts. | 16 |
| III | **Legal Framework Governing Forests and Wildlife**<br>The Biological Diversity Act, 2002 – Objectives, conservation, and access to biological resources.<br>The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 – Rights, governance, and conflicts.<br>Environmental Protection Act, 1986 – Legal framework and role in forest conservation.<br>National Green Tribunal (NGT) – Powers, jurisdiction, and impact on forest governance. | 16 |
| IV | **Legal Procedures, Forest Offences, and Protection Mechanisms**<br>Code of Criminal Procedure (CrPC), 1973 –<br>Definitions<br>Position of forest offences | 16 |

| | | |
|---|---|---|
| | Constitution and powers of criminal courts<br>Important sections relevant to forest conservation<br>Code of Civil Procedure (CPC), 1908 – Summons and discovery.<br>Indian Penal Code (IPC), 1860 –<br>Abetment of forest offences<br>Offences directly connected with forests and forest produce<br>Legal protection extended to Forest Officers<br>Indian Evidence Act, 1872 – Application in forestry-related matters. | |
| | **Total** | 64 |

**Textbooks:**


1. Chaturvedi, A.N. 2011. Forest Policy and Law. Khanna Bandhu Publishers, Dehradun.
2. Negi, S.S. 1997. Forest Policy and Law, IBD, Dehradun.
3. Dutta, R. and Yadav, B. 2012. Supreme Court on Forest Conservation. Universal Law Publishing Co., New Delhi, India
4. 5. Ernakulam Shetty, B. J. 1985. A Manual of Law for Forest Officers, Sharda Press, Mangalore
5. Takwani, C. K. T and Thakker, M. C. (2012). Takwani Criminal Procedure. Lexis Nexis Butterwarths Wadhwa, Nagpur.


**Reference Books:**


1. Krott, M. (2005). Forest policy analysis. Springer Science & Business Media.
2. McDermott, C., Cashore, B., & Kanowski, P. (2010). Global environmental forest policies: An international comparison. Routledge.
3. Mayers, J. (2013). Policy that works for forests and people: real prospects for governance and livelihoods. Routledge.


| **Paper II Major** | **Plantation Forestry**<br>**L-T-P-C: 2-1-0-3 Credit Unit: 3 Evaluation Scheme: T** | **Course Code FOR142M502** |
|---|---|---|

**Course Objective:**

This course aims to provide students intensive silvicultural practices for different forest plantations for obtaining higher utilizable biomass

**Course Outcome:**

| **On successful completion of the course, the students will able to:** | | **Bloom's cognitive level** |
|---|---|---|
| CO1 | Recall the tools, equipment, and techniques used in plantation establishment and maintenance. | BT 1 |
| CO2 | Explain the selection of species, planting methods, and aftercare practices for different types of plantations. | BT 2 |

**Detailed Syllabus**

| Modules | **Title of Unit and Contents** | **Hours** |
|---|---|---|
| I | **Fundamentals of Plantation Forestry**<br>Definition, scope, aims, and objectives of plantation forestry.<br>Historical perspectives – Indian and global scenario.<br>Role of plantations in meeting wood demand – Purpose, scale, and rate of plantation.<br>Site selection – Factors determining species choice, tree species for different sites.<br>Production technology for quality planting materials – Nursery techniques and mechanization in plantation establishment. | 16 |
| II | **Plantation Management and Silvicultural Practices**<br>Planting program – Season, pattern, spacing, and methods.<br>Post-planting activities – Tending, irrigation, nutrient management, and health monitoring. | 16 |

| | | |
|---|---|---|
| | Stand dynamics – Stand density and growth development.<br>Industrial and energy plantations – Models, species selection, precision silviculture.<br>Plantations for timber, pulp, plywood, matchwood, and NTFPs.<br>High-Density Short Rotation Forestry – Carbon sequestration, carbon credits, and CDM projects. | |
| III | **Harvesting, Coppice Silviculture, and Plantation Economics**<br>Harvesting types and patterns – Domestic, industrial, and export requirements.<br>Harvesting operations – Delimbing, bucking, debarking, in-situ chipping, and transportation.<br>Coppice silviculture – Principles, mechanisms, and management.<br>Economics of plantations – Financial considerations and investment models. | 16 |
| | **Total** | 48 |

**Textbooks:**


1. Balasubramanian, A., Hari Prasath, C.N., Radhakrishnan, S. 2020. Textbook on Plantation Forestry. Jain Publication, New Delhi, p336.
2. Luna, R. K. 1989. Plantation Forestry in India. International Book Distributors, Dehradun.
3. Ram Prakash, R. 1998. Plantation and nursery technique of forest trees. International Book Distributors, Dehradun.
4. Evans, J. 1982. Plantation forestry in the tropics: Clarendon Press, Oxford, Oxford Science Publications, Oxford University Press.


**Reference Books:**


1. West, P. W. (2014). Growing plantation forests. Springer-Verlag.
2. Sargent, C., & Bass, S. (2013). Plantation politics: forest plantations in development. Routledge.
3. Bennett, B. M. (2015). Plantations and protected areas: A global history of forest management. MIT Press.


| **Paper II Major** | **Plantation Forestry Practical**<br>**L-T-P-C: 0-0-2-1 Credit Unit: 1 Evaluation Scheme: P** | **Course Code FOR142M512** |
|---|---|---|

**Course Objective:**

This course aims to provide students intensive silvicultural practices for different forest plantations for obtaining higher utilizable biomass

**Course Outcome:**

| **On successful completion of the course, the students will able to:** | | **Bloom's cognitive level** |
|---|---|---|
| CO1 | Apply knowledge of irrigation, fertilization, and tending operations to optimize plantation growth and productivity. | BT 3 |
| CO2 | Analyze the economic considerations, financial planning, and comparative management of government and private plantations. | BT 4 |

**Detailed Syllabus**

| Modules | **Title of Unit and Contents** | **Hours** |
|---|---|---|
| I | **Practical Plantation Management**<br>Tools, equipment, and site preparation.<br>Plantation visits – Management practices.<br>Project planning, evaluation, and appraisal.<br>Species selection, planting, and aftercare.<br>Irrigation, fertilization, and tending operations.<br>Plantation records, economics, and finance.<br>Government vs. private plantations – Case studies. | 16 |

| | | |
|---|---|---|
| | **Total** | 16 |

**Textbooks:**


1. Balasubramanian, A., Hari Prasath, C.N., Radhakrishnan, S. 2020. Textbook on Plantation Forestry. Jain Publication, New Delhi, p336.
2. Luna, R. K. 1989. Plantation Forestry in India. International Book Distributors, Dehradun.
3. Ram Prakash, R. 1998. Plantation and nursery technique of forest trees. International Book Distributors, Dehradun.
4. Evans, J. 1982. Plantation forestry in the tropics: Clarendon Press, Oxford, Oxford Science Publications, Oxford University Press.


**Reference Books:**


1. West, P. W. (2014). Growing plantation forests. Springer-Verlag.
2. Sargent, C., & Bass, S. (2013). Plantation politics: forest plantations in development. Routledge.
3. Bennett, B. M. (2015). Plantations and protected areas: A global history of forest management. MIT Press.


| **Paper III Major** | **Tree Improvement**<br><br>**L-T-P-C: 2-1-0-3 Credit Unit: 3 Evaluation Scheme: T** | **Course Code FOR142M503** |
|---|---|---|

**Course Objective:**

This course aims to provide students a balanced and broad understanding of concepts and techniques related to tree breeding and tree improvement strategies.

**Course Outcome:**

| **On successful completion of the course, the students will able to:** | | **Bloom's cognitive level** |
|---|---|---|
| CO1 | Recall key concepts of tree breeding, genetic tests, and seed orchard management. | BT 1 |
| CO2 | Explain selection methods, hybridization techniques, and genetic evaluation processes in tree improvement programs. | BT 2 |

**Detailed Syllabus**

| Modules | **Title of Unit and Contents** | **Hours** |
|---|---|---|
| I | **Fundamentals of Tree Breeding and Improvement**<br>History and development of tree improvement.<br>Objectives, advantages, and limitations of tree breeding.<br>Key terminologies and major breeding programs in India & globally.<br>Domestication, exotic species, and challenges in tree improvement.<br>Reproductive systems – Pollination**, anthesis, and variation.** | 16 |
| II | **Breeding Methods and Hybridization**<br>Selection methods – Mass selection, pure line, plus tree selection.<br>Hybridization – Types, genetic consequences, and heterosis.<br>Natural hybrids – Occurrence, determination, and future prospects.<br>Mating design – Types, advantages, and genetic parameters.<br>Genetic tests – Provenance, progeny, seed source, and clonal tests. | 16 |
| III | **Variety Development and Testing**<br>Experimental design – RBD, genotype-environment interactions.<br>Tree variety release – Procedures and protocols.<br>PPVFRA – Breeder's, farmer's, traditional, and tribal varieties.<br>DUS testing – Guidelines, procedures, and recent advancements.<br>Development of tree descriptors and testing centers. | 16 |
| | **Total** | 48 |

**Textbooks:**

1. Bruce Zobel and John Talbert. 1984. Applied Forest Tree Improvement. John Wiley and Sons, New York. pp504.
2. Parthiban, K.T., N. Krishna Kumar and P.S. Devanand. 2020. Tree Breeding and Improvement Theory and Technology. Scientific Publishers (India), Jodhpur, India (ISBN No.: 978-93- 89412-83-3).
3. Surendran, C., R.N. Sehgal and M. Paramathma. 2003. Forest Tree Breeding. ICAR, New Delhi. P. 204.

**Reference Books:**

1. Parthiban, K. T., Krishnakumar, N., & Devanand, P. S. (2020). Tree breeding and improvement theory and technology. Scientific Publishers.
2. Williams, E. R., Matheson, A. C., & Harwood, C. E. (2002). Experimental design and analysis for tree improvement. CSIRO publishing.

| **Paper III Major** | **Tree Improvement Practical**<br><br>**L-T-P-C: 0-0-2-1 Credit Unit: 1 Evaluation Scheme: P** | **Course Code FOR142M513** |
|---|---|---|

**Course Objective:**

This course aims to provide students a balanced and broad understanding of concepts and techniques related to tree breeding and tree improvement strategies.

**Course Outcome:**

| **On successful completion of the course, the students will able to:** | | **Bloom's cognitive level** |
|---|---|---|
| CO1 | Apply knowledge of genetic variation, heritability, and experimental designs for tree breeding and evaluation. | BT 3 |
| CO2 | Analyze genetic test results, seed orchard behavior, and the development of tree varietal descriptors. | BT 4 |

**Detailed Syllabus**

| Modules | **Title of Unit and Contents** | **Hours** |
|---|---|---|
| I | **Practical**<br>Selection methods for tree improvement programs.<br>Hybridization – Interspecific & intraspecific evaluation.<br>Controlled breeding – Genetic variation & heritability.<br>Genetic tests – Provenance, progeny, seed source, and clonal tests.<br>Experimental design – RBD & genetic test analysis.<br>Seed orchards – Genetic behavior & management.<br>Forest genetic resources & progeny evaluation visits.<br>Developing descriptors for tree varietal registration. | 16 |
| | **Total** | 16 |

**Textbooks:**

1. Bruce Zobel and John Talbert. 1984. Applied Forest Tree Improvement. John Wiley and Sons, New York. pp504.
2. Parthiban, K.T., N. Krishna Kumar and P.S. Devanand. 2020. Tree Breeding and Improvement Theory and Technology. Scientific Publishers (India), Jodhpur, India (ISBN No.: 978-93- 89412-83-3).
3. Surendran, C., R.N. Sehgal and M. Paramathma. 2003. Forest Tree Breeding. ICAR, New Delhi. P. 204.

**Reference Books:**

1. Parthiban, K. T., Krishnakumar, N., & Devanand, P. S. (2020). Tree breeding and improvement theory and technology. Scientific Publishers.
2. Williams, E. R., Matheson, A. C., & Harwood, C. E. (2002). Experimental design and analysis for tree improvement. CSIRO publishing.

| **Paper Minor** | **Farming based livelihood systems**<br><br>**L-T-P-C: 3-1-0-4 Credit Unit: 4 Evaluation Scheme: T** | **Course Code FOR142N501** |
|---|---|---|

**Course Objective:**

This course aims to disseminate the knowledge and skill how farming-based systems can be a source of livelihood.

**Course Outcome:**

| **On successful completion of the course, the students will able to:** | | **Bloom's cognitive level** |
|---|---|---|
| CO1 | Recall the key concepts of agricultural livelihood systems, farming systems, and related indicators. | BT 1 |
| CO2 | Explain the components of various farming systems and their contribution to rural livelihoods. | BT 2 |
| CO3 | Apply knowledge of farming systems integration and livelihood models across diverse agro-climatic zones. | BT 3 |

**Detailed Syllabus**

| Modules | **Title of Unit and Contents** | **Hours** |
|---|---|---|
| I | **Agricultural Livelihood Systems in India**<br>Status of agriculture in India & different states.<br>Income & livelihood patterns of farmers & rural communities.<br>Indicators for studying livelihood systems. | 16 |
| II | **Farming Systems & Livelihood Approaches**<br>Agricultural livelihood systems (ALS) – meaning & framework.<br>Traditional & modern farming systems in India.<br>Components: Crops, livestock, horticulture, agroforestry, aquaculture, & secondary enterprises. | 16 |
| III | **Integration & Feasibility of Farming Systems**<br>Factors affecting integration of farming enterprises.<br>Feasibility of different farming systems across agro-climatic zones.<br>Commercial farming models (NABARD, ICAR, etc.).<br>Case studies on farming-based livelihood enterprises. | 16 |
| IV | **Policies, Risks & Future Prospects**<br>Government schemes & programs for farming livelihoods.<br>Public & private organizations promoting farming-based livelihoods.<br>Risks, success factors & role of farming in circular & green economy.<br>Impact of climate change, digitalization & lifestyle changes on farming livelihoods. | 16 |
| | **Total** | 64 |

**Textbooks:**


1. Reddy, S.R. 2016. Farming System and Sustainable Agriculture, Kalyani Publishers, New Delhi.
2. Panwar et al. 2020. Integrated Farming System models for Agricultural Diversification,
3. Enhanced Income and employment, Indian Council of Agricultural Research, New Delhi.
4. Singh, J.P., et al. 2015. Region Specific Integrated Farming System Models, ICAR-Indian Institute of Farming Systems Research, Modipuram.
5. Walia, S. S. and U. S. Walia, 2020. Farming System and Sustainable Agriculture, Scientific Publishers, Jodhpur, Rajasthan.


**Reference Books:**


1. Behera, U. K., & France, J. (2016). Integrated farming systems and the livelihood security of small and marginal farmers in India and other developing countries. Advances in agronomy, 138, 235-282.
2. Singh, G., & Kumar, A. Chapter–6 Components of farming-based livelihood systems. Sura India Publication, 71.


## B. Sc. Course in Forestry: Semester-VI

| **Paper I Major** | **Forest Biotechnology** | **Course Code FOR142M601** |
|---|---|---|

| | L-T-P-C: 2-1-0-3 Credit Unit: 3 Evaluation Scheme: T | |
|---|---|---|

**Course Objective:**

This course aims to provide students with the knowledge on the principles, tools, possibilities and progress made in biotechnology.

**Course Outcome:**

| On successful completion of the course, the students will able to: | | Bloom's cognitive level |
|---|---|---|
| CO1 | Understand plant tissue culture concepts, media preparation, and sterilization techniques. | BT 1 |
| CO2 | Learn plant tissue culture techniques like shoot tip, meristem tip, and callus culture. | BT 2 |

**Detailed Syllabus**

| Modules | Title of Unit and Contents | Hours |
|---|---|---|
| I | **Introduction to Plant Tissue Culture and Biotechnology**<br>Concepts, history, and scope of plant tissue culture.<br>Media components, sterilization techniques, and factors affecting in vitro cultures.<br>Regeneration methods: morphogenesis, organogenesis, and embryogenesis.<br>Techniques in plant tissue culture: micropropagation, meristem tip culture, somatic embryogenesis, protoplast fusion, and secondary metabolite production. | 16 |
| II | **Genetic Engineering and Molecular Biology Techniques**<br>Introduction to biotechnology and its role in crop improvement.<br>Direct and indirect gene transfer methods in plants: Agrobacterium**,** microinjection, particle bombardment. | 16 |
| III | **Applications of Plant Biotechnology and Genetic Engineering in Forestry**<br>Micropropagation in forest trees: bamboo, eucalyptus, sandalwood, and others.<br>Bioprospecting industrially useful compounds from forest trees.<br>Molecular markers in forestry and applications in genetic improvement.<br>Role of genetic engineering in improving traits like resistance to pests, diseases, and abiotic stress in forestry species. | 16 |
| | **Total** | 48 |

**Textbooks:**


1. Brown, T. A. 2010. Gene Cloning and DNA Analysis: An Introduction, 6th edn, Wiley-Blackwell Companion site
2. Krebs, J.E, Goldstein, E.S, Kilpatrick, S.T. 2017. Lewin's Genes XII. Jones and Bartlett Publishers, Inc., p.838
3. Malacinski, GM (2015) Freifelder's Essentials of Molecular Biology (4th Student edn) Jones and Bartlett Publishers, Inc.
4. Nelson D.L and M.M. Cox. 2017. Lehninger Principles of Biochemistry, (7th edn) W. H. Freeman and Company, New York, USA. p.1328.


**Reference Books:**


1. Asiegbu, F. O., & Kovalchuk, A. (Eds.). (2025). Biotechnology Applications in Forestry: Forest Microbiology Volume 4 (Vol. 4). Elsevier.
2. Razdan, M. K., & Kumar, A. (Eds.). (2024). Biotechnological Approaches for Sustaining Forest Trees and Their Products. Springer Nature Singapore.


| Paper I Major | Forest Biotechnology Practical | Course Code FOR142M611 |
|---|---|---|

| | L-T-P-C: 0-0-2-1 Credit Unit: 1 Evaluation Scheme: P | |
|---|---|---|

**Course Objective:**
This course aims to provide students with the knowledge on the principles, tools, possibilities and progress made in biotechnology.

**Course Outcome:**

| On successful completion of the course, the students will able to: | | Bloom's cognitive level |
|---|---|---|
| CO1 | Apply genetic transformation methods like biolistic and Agrobacterium-mediated transformation. | BT 3 |

**Detailed Syllabus**

| Modules | Title of Unit and Contents | Hours |
|---|---|---|
| IV | **Biotechnology Laboratory Techniques**<br>**Basics of lab setup, safety, and sterilization.**<br>Media preparation, shoot tip, meristem tip, and callus culture; hardening of plants.<br>Biolistic and Agrobacterium-mediated transformation.<br>Field Visit: Plant Biotechnology Lab/Commercial Tissue Culture facility. | 16 |
| | **Total** | 16 |

**Textbooks:**


1. Brown, T. A. 2010. Gene Cloning and DNA Analysis: An Introduction, 6th edn, Wiley-Blackwell Companion site
2. Krebs, J.E, Goldstein, E.S, Kilpatrick, S.T. 2017. Lewin's Genes XII. Jones and Bartlett Publishers, Inc., p.838
3. Malacinski, GM (2015) Freifelder's Essentials of Molecular Biology (4th Student edn) Jones and Bartlett Publishers, Inc.
4. Nelson D.L and M.M. Cox. 2017. Lehninger Principles of Biochemistry, (7th edn) W. H. Freeman and Company, New York, USA. p.1328.


**Reference Books:**


1. Asiegbu, F. O., & Kovalchuk, A. (Eds.). (2025). Biotechnology Applications in Forestry: Forest Microbiology Volume 4 (Vol. 4). Elsevier.
2. Razdan, M. K., & Kumar, A. (Eds.). (2024). Biotechnological Approaches for Sustaining Forest Trees and Their Products. Springer Nature Singapore.


| Paper II Major | Forest Economics and Marketing<br>L-T-P-C: 3-1-0-4 Credit Unit: 4 Evaluation Scheme: T | Course Code FOR142M602 |
|---|---|---|

**Course Objective:**
This course aims to exposure to the students on market concepts, marketing of forestry commodities, intermediaries involved, risks in forestry marketing, marketing institutions involved, price dynamics and the role of Government in regulation of markets

**Course Outcome:**

| On successful completion of the course, the students will able to: | | Bloom's cognitive level |
|---|---|---|
| CO1 | Define and explain key economic principles and their applications in forestry. | BT 1 |
| CO2 | Apply utility theory and equilibrium analysis to real-world scenarios. | BT 2 |
| CO3 | Calculate elasticity, price spread, and assess market equilibrium in forestry products. | BT 3 |
| CO4 | Estimate costs, farm financial ratios, and prepare bankable projects for forestry products. | BT 4 |

**Detailed Syllabus**

| Modules | Title of Unit and Contents | Hours |
|---|---|---|
| I | **Fundamentals of Economics and Forest Economics**<br>Definition and concepts of economics, divisions, and economic systems.<br>Forest economics: Characteristics, role in economic development, and national income (GNP & GDP).<br>Consumer behaviour: Utility theory, law of diminishing marginal utility, and consumer equilibrium. | 16 |
| II | **Market Structures and Marketing of Forest Products**<br>Demand theory: Law of demand, elasticity, and Engel's law.<br>Marketing functions: Producer surplus, marketing channels, price determination, and market equilibrium.<br>Forest products: Marketing efficiency, integration, and forecasting in various market structures. | 16 |
| III | **International Trade and Financial Management**<br>International trade: Concepts, free trade, WTO, and Free Trade Agreements.<br>Project preparation: Bank norms, crop insurance, SWOT analysis, and financial analysis.<br>Role of institutions: APEDA, MPEDA, ITTO, and their impact on agriculture. | 16 |
| IV | **Forest Products Economics & Market Analysis**<br>Consumer Equilibrium: Utility approaches.<br>Demand & Supply: Elasticity calculations.<br>Production: Marginal returns and optimal output.<br>Cost Estimation: Cultivation and production costs.<br>Project Preparation: Bankable forestry projects.<br>Financial Ratios: Farm financial analysis.<br>Market Analysis: Surplus, price spread, and market structure.<br>Market Research: Index numbers and market visits. | 16 |
| | **Total** | 64 |

Textbooks:


1. Acharya S.S. and Agarwal NL. 2011. Agricultural Marketing in India. Fifth Edition. Oxford and IBH Publishers, New Delhi
2. Chadra P. 1984. Projects: Preparation, Appraisal and Implementation, McGraw Hill Inc.
3. Charya SS and Agarwal NL. 2011. Agricultural Marketing in India. Fifth Edition. Oxford and IBH Publishers, New Delhi.
4. Dewett K. K. 2005. Modern Economic Theory. S. Chand and Company, New Delhi.


**Reference Books:**


1. Sills, E. O., & Abt, K. L. (Eds.). (2003). Forests in a market economy (Vol. 72). Springer Science & Business Media.
2. Price, C. (1989). The theory and application of forest economics (p. 402). Oxford: Basil Blackwell.


| Paper III Major | Remote Sensing and GIS Applications<br>L-T-P-C: 1-1-0-2 Credit Unit: 2 Evaluation Scheme: T | Course Code FOR142M603 |
|---|---|---|

**Course Objective:**

This course aims to enable the students to know about the remote sensing methods and applications in NRM, digital image processing and concepts of GIS and data management

**Course Outcome:**

| **On successful completion of the course, the students will able to:** | | **Bloom's cognitive level** |
|---|---|---|
| CO1 | Understand remote sensing and GIS hardware and software. | BT 1 |
| CO2 | Apply GIS techniques in map digitization and data editing. | BT 2 |
| CO3 | Interpret aerial photographs and satellite imagery for resource management. | BT 3 |

**Detailed Syllabus**

| Modules | **Title of Unit and Contents** | **Hours** |
|---|---|---|
| I | Introduction to Remote Sensing and Data Acquisition<br><br>Basics of Remote Sensing (RS), advantages, and limitations<br>Electromagnetic spectrum, energy interactions, and major atmospheric windows<br>Spectral reflectance curves for vegetation, soil, and water<br>Sensors and platforms: Types and functions; aerial photography and photogrammetry basics<br>Aerial photo interpretation and stereoscopic vision | 16 |
| II | **Satellite Remote Sensing and Image Analysis**<br><br>Satellite remote sensing techniques: Multispectral scanners, whiskbroom, and push-broom scanners<br>Image analysis: Digital data restoration, enhancement, and information extraction<br>Image classification: Unsupervised and supervised classification methods<br>Vegetation indices and microwave remote sensing basics | 16 |
| | **Total** | 32 |

**Textbooks:**


1. Elangovan, K. 2006. GIS Fundamentals Applications and Implementations. New India Publication Agency, New Delhi.
2. George, J. 2005. Fundamentals of Remote Sensing. 2nd Edn. Universities Press (India) Private Limited, Hyderabad.
3. Jensen, J. R. 2013. Remote Sensing of the Environment: An Earth Resource Perspective. Pearson Education Limited, UK.
4. Lillesand, T., Kiefer, R. W. and Chipman, J. 2015. Remote Sensing and Image Interpretation. 7th Edition, John Wiley and Sons Singapore Pvt. Ltd., Singapore.


**Reference Books:**


1. Liu, J. G., & Mason, P. J. (2016). Image processing and GIS for remote sensing: Techniques and applications. John Wiley & Sons.
2. Mesev, V. (2007). Integration of GIS and remote sensing. John Wiley & Sons.


| **Paper III Major** | **Remote Sensing and GIS Applications Practical**<br><br>**L-T-P-C: 0-0-4-2 Credit Unit: 2 Evaluation Scheme: P** | **Course Code FOR142M613** |
|---|---|---|

**Course Objective:**

This course aims to enable the students to know about the remote sensing methods and applications in NRM, digital image processing and concepts of GIS and data management

**Course Outcome:**

| **On successful completion of the course, the students will able to:** | | **Bloom's cognitive level** |
|---|---|---|
| CO1 | Apply GIS techniques in map digitization and data editing. | BT 2 |

| | | |
|---|---|---|
| CO2 | Interpret aerial photographs and satellite imagery for resource management. | BT 3 |
| CO3 | Conduct GIS-supported case studies for resource management. | BT 4 |

**Detailed Syllabus**

| Modules | **Title of Unit and Contents** | **Hours** |
|---|---|---|
| I | **GIS and Applications in Resource Management**<br><br>Basic components of GIS: Spatial data, map projections, and data input methods<br>Data editing, spatial data models, and attribute data management<br>GIS data integration (map overlay) for land and water resources management<br>Applications of remote sensing and GIS in environmental monitoring and resource management | 16 |
| II | **Remote Sensing and GIS Applications in Resource Management**<br><br>Familiarization with remote sensing and GIS hardware<br>Software for image interpretation and aerial photograph/satellite imagery analysis<br>Basic GIS operations: Image display, scanning, digitization, and data editing<br>Database query and map algebra<br>GIS-supported case studies in water resources management | 16 |
| | **Total** | 32 |

**Textbooks:**


1. Elangovan, K. 2006. GIS Fundamentals Applications and Implementations. New India Publication Agency, New Delhi.
2. George, J. 2005. Fundamentals of Remote Sensing. 2nd Edn. Universities Press (India) Private Limited, Hyderabad.
3. Jensen, J. R. 2013. Remote Sensing of the Environment: An Earth Resource Perspective. Pearson Education Limited, UK.
4. Lillesand, T., Kiefer, R. W. and Chipman, J. 2015. Remote Sensing and Image Interpretation. 7th Edition, John Wiley and Sons Singapore Pvt. Ltd., Singapore.


**Reference Books:**


1. Liu, J. G., & Mason, P. J. (2016). Image processing and GIS for remote sensing: Techniques and applications. John Wiley & Sons.
2. Mesev, V. (2007). Integration of GIS and remote sensing. John Wiley & Sons.


| **Paper IV Major** | **Forest Tribology, Ethnomedicine and Extension**<br><br>**L-T-P-C: 2-1-0-3 Credit Unit: 3 Evaluation Scheme: T** | **Course Code FOR142M604** |
|---|---|---|

**Course Objective:**

This course aims to impart basic knowledge on local indigenous peoples their knowledge on ethno medicines and the extension skills and knowledge with reference to forestry.

**Course Outcome:**

| **On successful completion of the course, the students will able to:** | | **Bloom's cognitive level** |
|---|---|---|
| CO1 | Learn key concepts in tribology related to forest management. | BT 1 |
| CO2 | Study tribal plant-based medicines and their uses. | BT 2 |
| CO3 | Examine forest products' role in tribal livelihoods. | BT 3 |

**Detailed Syllabus**

| Modules | **Title of Unit and Contents** | **Hours** |
|---|---|---|
| I | **Tribes and Forests**<br>Definition and characteristics of tribes, tribal economy, and racial classification.<br>Tribes in India, with focus on North East India and Assam.<br>Tribal identity, integration issues, and tribal welfare in India.<br>Relationship between tribes and forests, role of forest resources in their livelihood.<br>Forest management and conflicts, role of forest department and tribal welfare. | 16 |
| II | **Ethno-Medicine and Traditional Knowledge**<br>Ethno-medicines of tribals in Northeast India, particularly traditional botanical knowledge.<br>Medicinal plants from families: Guttiferae, Malvaceae, Fabaceae, Rubiaceae, etc.<br>Role of Non-Wood Forest Products (NWFPs) in tribal economy.<br>Social forestry and tribal welfare through forest resources. | 16 |
| III | **Extension Education and Rural Development**<br>Introduction to extension education, its nature, scope, and objectives.<br>Rural development concepts, objectives, and technology transfer programs like RD, KVK, OFT, FLD.<br>ICT-enabled extension services and communication models.<br>Participatory Rural Appraisal (PRA) and evaluation techniques.<br>Rural social groups and their roles in development. | 16 |
| | **Total** | 48 |

**Textbooks:**


1. FAO. 1984. Forestry extension, making it works, An international journal of forestry and forest industries, Unasylva - No. 143, Published by FAO.
2. Furer-Haimendorf, C.V. 1985. Tribes of India - the struggle for survival. OUP. New Delhi Hasnain, N. 2007. Tribal India. New Royal Book Company
3. K.A. Jalihal and V. Veerabhadraiah. 2007. Fundamentals of Extension Education and Management in Extension, Concept Publishing Company.
4. L.K. Jha and P. K. Sen Sarma, A.P.H. 2008. A Manual of Forestry Extension Education, Published by VEDAMS, P. 386 p.


**Reference Books:**


1. Mhaiske, V. M., Patil, V. K., & Narkhede, S. S. (2016). Forest tribology and anthropology. Scientific Publishers.
2. Hemmami, H., Messaoudi, M., Sawicka, B., Zahnit, W., Osmani, N., Benmohamed, M., & Rebiai, A. (2024). The Importance of Traditional Resources in Ethnomedicine. In Traditional Resources and Tools for Modern Drug Discovery: Ethnomedicine and Pharmacology (pp. 91-127). Singapore: Springer Nature Singapore.


| **Paper IV Major** | **Forest Tribology, Ethnomedicine and Extension**<br>**L-T-P-C: 0-0-2-1 Credit Unit: 1 Evaluation Scheme: P** | **Course Code FOR142M614** |
|---|---|---|

**Course Objective:**

This course aims to impart basic knowledge on local indigenous peoples their knowledge on ethno medicines and the extension skills and knowledge with reference to forestry.

**Course Outcome:**

| **On successful completion of the course, the students will able to:** | | **Bloom's cognitive level** |
|---|---|---|
| CO1 | Examine forest products' role in tribal livelihoods. | BT 3 |
| CO2 | Implement extension methods for tribal welfare and rural development. | BT 4 |

**Detailed Syllabus**

| Modules | Title of Unit and Contents | Hours |
|---|---|---|
| I | **Field Visits and Practical Training**<br>Study KVKs, ICFRE institutes, and local governance functions.<br>Prepare village-level production plans, charts, and posters.<br>Participate in exhibitions, method demos, and PRA exercises.<br>Visit tribal regions for ethnobotanical knowledge and plant identification.<br>Collect and prepare herbarium specimens of medicinal and social plants. | 16 |
| | **Total** | 16 |

**Textbooks:**


1. FAO. 1984. Forestry extension, making it works, An international journal of forestry and forest industries, Unasylva - No. 143, Published by FAO.
2. Furer-Haimendorf, C.V. 1985. Tribes of India - the struggle for survival. OUP. New Delhi Hasnain, N. 2007. Tribal India. New Royal Book Company
3. K.A. Jalihal and V. Veerabhadraiah. 2007. Fundamentals of Extension Education and Management in Extension, Concept Publishing Company.
4. L.K. Jha and P. K. Sen Sarma, A.P.H. 2008. A Manual of Forestry Extension Education, Published by VEDAMS, P. 386 p.


**Reference Books:**


1. Mhaiske, V. M., Patil, V. K., & Narkhede, S. S. (2016). Forest tribology and anthropology. Scientific Publishers.
2. Hemmami, H., Messaoudi, M., Sawicka, B., Zahnit, W., Osmani, N., Benmohamed, M., & Rebiai, A. (2024). The Importance of Traditional Resources in Ethnomedicine. In Traditional Resources and Tools for Modern Drug Discovery: Ethnomedicine and Pharmacology (pp. 91-127). Singapore: Springer Nature Singapore.


| **Paper Minor** | **Forest Entrepreneurship and Business Management**<br>**L-T-P-C: 3-1-0-4 Credit Unit: 4 Evaluation Scheme: T** | **Course Code FOR142N601** |
|---|---|---|

**Course Objective:**
This course aims to provide the students an insight into the concept and scope of entrepreneurship and develop financially viable agribusiness proposal.

**Course Outcome:**

| **On successful completion of the course, the students will able to:** | | **Bloom's cognitive level** |
|---|---|---|
| CO1 | Understand key concepts and characteristics of entrepreneurship. | BT 1 |
| CO2 | Identify opportunities and develop skills for enterprise planning and management. | BT 2 |
| CO3 | Analyze the factors influencing product/service selection and business formulation. | BT 3 |
| CO4 | Apply financial, production, and marketing management techniques in entrepreneurship. | BT 4 |

**Detailed Syllabus**

| Modules | Title of Unit and Contents | Hours |
|---|---|---|
| I | **Introduction to Entrepreneurship**<br>Concepts and importance of entrepreneurship | 16 |

| | | |
|---|---|---|
| | Characteristics and competencies of entrepreneurs<br>Evolution and types of entrepreneurs<br>Environmental and social factors affecting entrepreneurship<br>Infrastructure, support systems, and financial institutions | |
| II | **Enterprise Planning and Development**<br>Opportunity identification and environmental scanning<br>Product/service selection, registration, and ownership forms<br>Project identification, selection, and formulation<br>Planning, capital sources, and enterprise management | 16 |
| III | **Enterprise Management and Marketing**<br>Production management: quality control, cost, inventory, and raw materials<br>Financial management: costing, pricing, bookkeeping, and taxation<br>Marketing strategies and crisis management in enterprise<br>Personal management: manpower planning, wages, and labor turnover | 16 |
| IV | Visit to small scale industries/agro-industries, Interaction with successful entrepreneurs/ agric- entrepreneurs.<br>Visit to financial institutions and support agencies. Preparation of project proposal for funding by different agencies. | 16 |
| | **Total** | 64 |

Textbooks:


1. Charantimath P.M. 2009. Entrepreneurship Development and Small Business Enterprises. Pearson Publications, New Delhi.
2. Desai V. 2015. Entrepreneurship: Development and Management, Himalaya Publishing House.
3. Desai, Vasant 1997. Small Scale Industries and Entrepreneurship. Himalaya Publ. House
4. Grover Indu. 2008. Handbook on Empowerment and Entrepreneurship. Agrotech Public Academy.


**Reference Books:**


1. Schmithüsen, F., Kaiser, B., Schmidhauser, A., Mellinghoff, S., Perchthaler, K., & Kammerhofer, A. (2015). Entrepreneurship and management in forestry and wood processing: principles of business economics and management processes. Routledge.
2. Panwar, R., Kozak, R. A., & Hansen, E. (Eds.). (2016). Forests, business and sustainability. New York, NY, USA: Routledge.


## B. Sc. Course in Forestry: Semester-VII

| **Paper I Major** | **Wood Science and Technology**<br>**L-T-P-C: 2-1-0-3 Credit Unit: 3 Evaluation Scheme: T** | **Course Code FOR142M701** |
|---|---|---|

**Course Objective:**

This course aims to make students aware about the problems related to wood as basic material to manufacture various useful products

**Course Outcome:**

| **On successful completion of the course, the students will able to:** | | **Bloom's cognitive level** |
|---|---|---|
| CO1 | Understand the physical, mechanical, and chemical properties of wood and their impact on its applications. | BT 1 |
| CO2 | Learn various wood processing techniques, including seasoning, preservation, and composite manufacturing. | BT 2 |
| CO3 | Analyze the role of wood-based industries in the Indian economy and sustainable resource management. | BT 3 |

**Detailed Syllabus**

| Modules | **Title of Unit and Contents** | **Hours** |
|---|---|---|
| I | Wood Properties and Water Relationship<br>Natural defects in wood<br>Mechanical properties: tension, compression, bending, shearing<br>Wood-water relationship: hygroscopic nature, moisture content, shrinkage, and swelling<br>Determination of moisture content and fibre saturation point | 16 |
| II | **Wood Seasoning Techniques**<br>Principles and importance of wood seasoning<br>Methods: air seasoning, kiln seasoning, and chemical seasoning<br>Special seasoning methods and control of seasoning defects<br>Refractory classes of timbers and kiln schedules | 16 |
| III | **Wood Preservation and Treatment**<br>Wood biodeterioration and classification based on durability<br>Wood preservatives and their types: water-soluble, oil-based, fire retardants<br>Methods of application: brushing, steeping, hot/cold bath, pressure methods<br>Merits and demerits of different preservation techniques | 16 |
| | **Total** | 48 |

**Textbooks:**


1. Bowyer J. L., Shmulsky, R. and Haygreen, J. G. 2007. Forest products and wood science: An introduction. 5th Ed. Blackwell publishing, Ames, IA. 496p.
2. Brown, H. P. 1985. Manual of Indian wood technology. International books and periodicals supply service, New Delhi. 121 p.
3. Divya, M.P., Parthiban, K.T., Packialakshmi, M. and S. Krishnamoorthi. 2022. Text Book on Wood Products and Utilization. Scientific Publishers, Jodhpur (ISBN No.: 9789392590795).
4. FRI. [Forest Research Institute]. 1976. Indian forest utilization. Volume I and II. Forest Research Institute, Dehradun. 941p.
5. Panshin, A. J. and De Zeeuw, C. 1980. Textbook of wood technology, 4th Ed. McGraw-Hill. New York, USA: 722p.


**Reference Books:**


1. Niemz, P., Teischinger, A., & Sandberg, D. (Eds.). (2023). Springer handbook of wood science and technology (Vol. 1, pp. 281-353). Cham: Springer.
2. Kollmann, F. F., Kuenzi, E. W., & Stamm, A. J. (2012). Principles of wood science and technology: II wood based materials. Springer Science & Business Media.
3. Wenzl, H. (2012). The chemical technology of wood. Elsevier.


| **Paper I Major** | **Wood Science and Technology Practical**<br>**L-T-P-C: 0-0-2-1 Credit Unit: 1 Evaluation Scheme: P** | **Course Code FOR142M711** |
|---|---|---|

**Course Objective:**

This course aims to make students aware about the problems related to wood as basic material to manufacture various useful products

**Course Outcome:**

| **On successful completion of the course, the students will able to:** | | **Bloom's cognitive level** |
|---|---|---|
| CO1 | Develop skills in wood testing, machining, and modern wood modification techniques for industrial applications. | BT 4 |

**Detailed Syllabus**

| Modules | **Title of Unit and Contents** | **Hours** |
|---|---|---|
| I | **Wood Testing, Seasoning, and Preservation**<br>Mechanical tests: static bending, impact bending, compression, shear, torsion, hardness | 16 |

| | | |
|---|---|---|
| | Moisture content determination and wood-water relationship<br>Shrinkage, swelling, and combustibility estimation<br>Non-destructive wood testing and lab visits<br>Seasoning methods, scheduling, and safety aspects<br>Wood preservation techniques: non-pressure and pressure methods | |
| | **Total** | 16 |

**Textbooks:**


1. Bowyer J. L., Shmulsky, R. and Haygreen, J. G. 2007. Forest products and wood science: An introduction. 5th Ed. Blackwell publishing, Ames, IA. 496p.
2. Brown, H. P. 1985. Manual of Indian wood technology. International books and periodicals supply service, New Delhi. 121 p.
3. Divya, M.P., Parthiban, K.T., Packialakshmi, M. and S. Krishnamoorthi. 2022. Text Book on Wood Products and Utilization. Scientific Publishers, Jodhpur (ISBN No.: 9789392590795).
4. FRI. [Forest Research Institute]. 1976. Indian forest utilization. Volume I and II. Forest Research Institute, Dehradun. 941p.
5. Panshin, A. J. and De Zeeuw, C. 1980. Textbook of wood technology, 4th Ed. McGraw-Hill. New York, USA: 722p.


**Reference Books:**


1. Niemz, P., Teischinger, A., & Sandberg, D. (Eds.). (2023). Springer handbook of wood science and technology (Vol. 1, pp. 281-353). Cham: Springer.
2. Kollmann, F. F., Kuenzi, E. W., & Stamm, A. J. (2012). Principles of wood science and technology: II wood based materials. Springer Science & Business Media.
3. Wenzl, H. (2012). The chemical technology of wood. Elsevier.


| **Paper II Major** | **Forest Biomass Energy and Biofuels**<br><br>**L-T-P-C: 3-1-0-4 Credit Unit: 4 Evaluation Scheme: T** | **Course Code FOR142M702** |
|---|---|---|

**Course Objective:**

This course aims to make students aware about the need for forest-based bioenergy and biofuel towards creating self-reliance in raw material besides combating the climate change risks and uncertainties

**Course Outcome:**

| **On successful completion of the course, the students will able to:** | | **Bloom's cognitive level** |
|---|---|---|
| CO1 | Understand the types, availability, and potential of forest biomass for energy production. | BT 1 |
| CO2 | Analyze biomass properties, conversion technologies, and their role in renewable energy. | BT 2 |
| CO3 | Evaluate different biomass-based power generation methods, including pyrolysis, gasification, and combustion. | BT 3 |
| CO4 | Apply knowledge of biofuel production processes, including transesterification and SAF production, for sustainable energy solutions. | BT 4 |

**Detailed Syllabus**

| Modules | **Title of Unit and Contents** | **Hours** |
|---|---|---|
| I | **Energy Status and Biomass Resources**<br>Energy demand and supply in India<br>Conventional vs. alternative energy sources<br>National Policy on Biofuels (2018, 2022 Amendment)<br>Biomass availability and types (agricultural residues, TBOs, algal feedstock, UCO, animal tallow)<br>Challenges and constraints in biomass utilization | 16 |
| II | **Dendro Energy and TBOs**<br>Scope and potential of dendro energy in India | 16 |

| | | |
|---|---|---|
| | Properties, cultivation, and plantation models of dendro biomass<br>High-Density Energy Plantation (HDEP) and harvesting methods<br>Major TBO species and their cultivation (*Jatropha, Pongamia, Neem, Mahua, Simarouba*)<br>Value chain and market potential of TBOs | |
| III | **Biomass-Based Power and Biofuel Production**<br>Biomass-based power generation (pyrolysis, gasification, combustion)<br>Oil extraction from TBOs and transesterification for biodiesel production<br>Hydroprocessing of Esters and Fatty Acids (HEFA) for SAF production<br>Quality characteristics and applications of biodiesel and SAF | 16 |
| IV | **Dendro Energy and Biofuels**<br>Dendro energy species & QPM production<br>Biomass characterization & conversion<br>Energy plantation models & processing<br>Pyrolysis, gasification & combustion<br>Biofuel crops & TBOs (Jatropha, Pongamia, Neem, etc.)<br>Oil extraction, biodiesel & SAF production<br>Industrial visits: Gasification unit, biomass plant, oil processing center | 16 |
| | **Total** | 64 |

**Textbooks:**


1. Adams P, Bridgwater T, Langton L A, Ross A and Watson I. 2018. Biomass Conversion Technologies. Greenhouse Gas Balances of Bioenergy Systems. p134 (ISBN: 9780081010365).
2. Bajpai P. 2020. Biomass to Energy Conversion Technologies -The Road to Commercialization. Elsevier. P 204. (ISBN: 978-0-12-818400-4).
3. Hakem K R, Jawaid M and Rashid U. 2014. Biomass and Bioenergy - Processing and properties. Springer. P343. (ISBN : 978-3-319-07641-6).
4. Pande M and Bhaskarwar A N. 2012. Biomass conversion to Energy - The Interface of Biotechnology, Chemistry and Materials Science. Springer. p.468. (ISBN: 978-3-642-28418-2).


**Reference books:**


1. Dahiya, A. (Ed.). (2014). Bioenergy: Biomass to biofuels. Academic Press.
2. Cheng, J. (Ed.). (2017). Biomass to renewable energy processes. CRC press.


| **Paper III Major** | **Watershed Planning and Management**<br>**L-T-P-C: 2-1-0-3 Credit Unit: 3 Evaluation Scheme: T** | **Course Code FOR142M703** |
|---|---|---|

**Course Objective:**

This course aims to acquaint the students with different aspects of watershed planning and management including participatory approaches and also on the integrated watershed management practices

**Course Outcome:**

| **On successful completion of the course, the students will able to:** | | **Bloom's cognitive level** |
|---|---|---|
| CO1 | Explain watershed characteristics, planning, and management principles. | BT 1 |
| CO2 | Implement soil and water conservation methods for sustainable watershed development. | BT 2 |
| CO3 | Analyse watershed data using GIS and remote sensing for planning and prioritization. | BT 3 |

**Detailed Syllabus**

| Modules | **Title of Unit and Contents** | **Hours** |
|---|---|---|
| I | **Introduction to Watershed Management**<br>Watershed characteristics, classification, and codification<br>Concepts, objectives, and principles of watershed management<br>Factors affecting watershed planning, land capability classification<br>Watershed delineation, prioritization, and sediment yield index | 16 |
| II | **Watershed Conservation and Management**<br>Rainwater conservation: In-situ & ex-situ storage, water harvesting | 16 |

| | | |
|---|---|---|
| | Dry farming techniques, cropping systems, and land management<br>Integrated watershed management: Agriculture, forestry, fishery, and animal husbandry<br>Community participation: SHGs, user groups, participatory rural appraisal | |
| III | **GIS & Remote Sensing in Watershed Planning**<br>Basics of Remote Sensing, GIS, and spatial data structures<br>Delineation of watersheds, thematic map preparation, and HRU analysis<br>Hydrological modeling: SWAT and other models<br>Watershed evaluation, impact assessment, financial planning, and case studies | 16 |
| | **Total** | 48 |

**Textbooks:**


1. Das, G. 2008. Hydrology and Soil Conservation Engineering: Including Watershed Management. 2nd edn. Prentice-Hall of India Learning Pvt. Ltd., New Delhi.
2. Katyal, J. C., Singh, R. P., Sharma, S., Das, S. K., Padmanabhan, M. V. and Mishra, P. K. 1995. Field Manual on Watershed Management. CRIDA, Hyderabad.
3. Mahnot, S. C. 2014. Soil and Water Conservation and Watershed Management. International Books and Periodicals Supply Service. New Delhi.
4. Rajora, R. 2019.Integrated Watershed Management. Rawat Publications, New Delhi.
5. Sharda, V. N., Sikka, A. K. and Juyal, G. P. 2006. Participatory Integrated Watershed Management: A Field Manual. Central Soil and Water Conservation Research and Training Institute, Dehradun.


**Reference Books:**


1. Heathcote, I. W. (2009). Integrated watershed management: principles and practice. John Wiley & Sons.
2. Randhir, T. (2006). Watershed management. IWA Publishing.


| **Paper III Major** | **Watershed Planning and Management Practical**<br>**L-T-P-C: 0-0-2-1 Credit Unit: 1 Evaluation Scheme: P** | **Course Code FOR142M713** |
|---|---|---|

**Course Objective:**

This course aims to acquaint the students with different aspects of watershed planning and management including participatory approaches and also on the integrated watershed management practices

**Course Outcome:**

| **On successful completion of the course, the students will able to:** | | **Bloom's cognitive level** |
|---|---|---|
| CO1 | Analyse watershed data using GIS and remote sensing for planning and prioritization. | BT 3 |
| CO2 | Design and evaluate watershed management projects with financial and environmental considerations. | BT 4 |

**Detailed Syllabus**

| Modules | **Title of Unit and Contents** | **Hours** |
|---|---|---|
| I | **Watershed Planning and Management**<br>Watershed delineation using toposheets and surveying techniques<br>Preparation of watershed maps and quantitative analysis of watershed parameters<br>Hydrologic data analysis, water budgeting, and sediment measurement<br>Remote Sensing & GIS applications in watershed planning and prioritization<br>Design and components of watershed structures (earth embankments, conservation measures)<br>Role of stakeholders in watershed programs and financial management<br>Field visits to watershed development project areas | 16 |

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|---|---|---|
| | **Total** | 16 |

**Textbooks:**


1. Das, G. 2008. Hydrology and Soil Conservation Engineering: Including Watershed Management. 2nd edn. Prentice-Hall of India Learning Pvt. Ltd., New Delhi.
2. Katyal, J. C., Singh, R. P., Sharma, S., Das, S. K., Padmanabhan, M. V. and Mishra, P. K. 1995. Field Manual on Watershed Management. CRIDA, Hyderabad.
3. Mahnot, S. C. 2014. Soil and Water Conservation and Watershed Management. International Books and Periodicals Supply Service. New Delhi.
4. Rajora, R. 2019.Integrated Watershed Management. Rawat Publications, New Delhi.
5. Sharda, V. N., Sikka, A. K. and Juyal, G. P. 2006. Participatory Integrated Watershed Management: A Field Manual. Central Soil and Water Conservation Research and Training Institute, Dehradun.


**Reference Books:**


1. Heathcote, I. W. (2009). Integrated watershed management: principles and practice. John Wiley & Sons.
2. Randhir, T. (2006). Watershed management. IWA Publishing.


| **Paper IV Major** | **Industrial Agroforestry**<br><br>**L-T-P-C: 3-1-0-4 Credit Unit: 4 Evaluation Scheme: T** | **Course Code FOR142M704** |
|---|---|---|

**Course Objective:**

This course aims to develop skills and expertise on Industrial Agroforestry and associated supply and value chain management.

**Course Outcome:**

| **On successful completion of the course, the students will able to:** | | **Bloom's cognitive level** |
|---|---|---|
| CO1 | Explain watershed characteristics, planning, and management principles. | BT 1 |
| CO2 | Implement soil and water conservation methods for sustainable watershed development. | BT 2 |
| CO3 | Analyze watershed data using GIS and remote sensing for planning and prioritization. | BT 3 |
| CO4 | Design and evaluate watershed management projects with financial and environmental considerations. | BT 4 |

**Detailed Syllabus**

| Modules | **Title of Unit and Contents** | **Hours** |
|---|---|---|
| I | **Overview of Industrial Agroforestry**<br>Extent and status of forests & agroforestry (National & International).<br>Role of forests in industries – raw material demand & supply.<br>Major wood-based industries in India – timber, pulpwood, plywood, etc.<br>Policy and legal aspects of industrial plantations & agroforestry. | 16 |
| II | **Plantation Management & Value Addition**<br>Industrial agroforestry plantations – preferred species & management.<br>Precision silviculture techniques – propagation, pest & disease control.<br>Harvesting operations – mechanization & yield potential.<br>Value addition – utilization of plantation residues, briquettes & pellets. | 16 |
| III | **Marketing, Business, & Environmental Impact**<br>Supply chain & marketing of agroforestry products.<br>Contract farming – concept, methods, & industry collaborations.<br>Business innovations, CSR, and agroforestry entrepreneurship. | 16 |

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|---|---|---|
| | Economic, ecological, and socio-environmental impacts – carbon sequestration & trading. | |
| IV | **Industrial Agroforestry and Business Development**<br>Study of timber, pulp & paper, plywood, matchwood, and dendro energy agroforestry.<br>State-specific species for industrial agroforestry.<br>Plantation Management: Techniques in harvest, mechanization, and value addition.<br>Contract tree farming, economics, and project preparation.<br>Practical Exposure: Visits to wood and non-wood based industries, business opportunities, and DPR preparation for agroforestry business models. | 16 |
| | **Total** | 64 |

**Textbooks:**


1. Balasubramanian, A., Hari Prasath, C.N., Radhakrishnan, S. 2020. Textbook on Plantation Forestry. Jain Publication, New Delhi, p336.
2. Industrial Agroforestry: Perspective and Prospective. Scientific Publishers, Jodhpur, India. Pp:396.
3. Parthiban, K.T. and R. Seenivasan. 2017. Forestry Technologies- A complete Value Chain Approach. Scientific Publishers, Jodhpur. p 629.


**Reference books:**


1. Parthiban, K.T., R. Umarani, S. Umesh Kanna, I. Sekar, P. Rajendran and P. Durairasu. 2014.
2. Parthiban, K.T. and Keerthika, A. 2020. Textbook on Agroforestry – Principles, practices and Applications. Agrobios, Jodhpur, p256


| **Paper Minor** | **Trees Outside Forest (TOF)**<br>**L-T-P-C: 3-1-0-4 Credit Unit: 4 Evaluation Scheme: T** | **Course Code FOR142N701** |
|---|---|---|

**Course Objective:**

This course aims to make the students understand the growing importance of trees outside forests

**Course Outcome:**

| **On successful completion of the course, the students will able to:** | | **Bloom's cognitive level** |
|---|---|---|
| CO1 | Identify different types of Trees Outside Forests (TOF) and assessment methods. | BT 1 |
| CO2 | Describe regeneration, restoration, and nursery management of TOF. | BT 2 |
| CO3 | Apply market and agroforestry models to TOF management. | BT 3 |
| CO4 | Analyze the economic, environmental, and certification impacts of TOF. | BT 4 |

**Detailed Syllabus**

| Modules | **Title of Unit and Contents** | **Hours** |
|---|---|---|
| I | **Introduction to Trees Outside Forests (TOF) and Classification**<br>Types of TOF based on land use and geometric formation (settlements, agricultural lands, natural features).<br>FSI methods, stratified random sampling, and multistage stratified sampling.<br>TOF status in India, state-wise analysis, and opportunities for wood and non-wood products. | 16 |
| II | **Regeneration, Restoration, and Nursery Management**<br>Methods for quality planting material (QPM), design, development, and planting techniques.<br>Design, components, and criteria for species selection. | 16 |

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|---|---|---|
| | Timber and NTFPs, economic tree species, and models for agroforestry and farm forestry. | |
| III | **Economic and Environmental Impact of TOF**<br>Contribution to ecosystem services, carbon sequestration, and restoration of degraded lands.<br>Global and national status, market size, demand-supply, processing, and value addition.<br>National Forest Policy, National Agroforestry Policy, and regulations for market and trade channels. | 16 |
| IV | **TOF Certification, Carbon Trading, and Schemes**<br>TOF Certification, Carbon Trading, and Schemes<br>Certification and Standards: FSC, PEFC, SFI, IFWCC, and sustainable forestry initiatives.<br>Carbon Sequestration and Trading: UNFCC, Kyoto Protocol, carbon credit, and opportunities for farmers.<br>Schemes and Programs: National Bamboo Mission, Green Highways, GIM, NMOOP, and other related initiatives. | 16 |
| | **Total** | 64 |

**Textbooks:**


1. Parthiban, K.T. and A. Keerthika. 2020. A textbook of Agroforestry: Principles, Practices and Applications. AgroBios (India), Jodhpur. P. 256 (ISBN: 978-81-973776-8-9).
2. Parthiban, K.T. and R. Seenivasan. 2017. Forestry Technologies- A Complete Value Chain Approach. Scientific Publisher. Jodhpur. P.629 (ISBN: 978-93-86102-60-7).
3. Parthiban, K.T., R. Jude Sudhagar, C. Cinthia Fernandaz and K.K. Suresh. 2018. Agroforestry strategies for climate change (Mitigation and adaptation). Jaya Publishing House, New Delhi. P. 395 (ISBN:978-93-86110-53-4).


**Reference Books:**


1. Schnell, S. (2015). Integrating trees outside forests into national forest inventories (No. 2015: 37).
2. Beckschäfer, P., Schnell, S., & Kleinn, C. (2017). Monitoring and assessment of trees outside forests (TOF). Agroforestry: Anecdotal to Modern Science, 137-161.


## B. Sc. Course in Forestry: Semester-VIII

| **Paper I Major** | **Innovations in Forest Product and Utilization**<br>**L-T-P-C: 3-1-0-4 Credit Unit: 4 Evaluation Scheme: T** | **Course Code FOR142M801** |
|---|---|---|

**Course Objective:**

This course aims to provide students with the knowledge on the wood and wood panel related industries

**Course Outcome:**

| **On successful completion of the course, the students will able to:** | | **Bloom's cognitive level** |
|---|---|---|
| CO1 | Identify various wood-based industries and their products. | BT 1 |
| CO2 | Understand the primary conversion techniques and their applications. | BT 2 |
| CO3 | Analyse the properties and uses of different wood composites. | BT 3 |
| CO4 | Evaluate modern wood modification techniques for industry applications. | BT 4 |

**Detailed Syllabus**

| Modules | **Title of Unit and Contents** | **Hours** |
|---|---|---|
| I | **Wood-Based Industries and their Role in the Economy**<br>Growth and importance of wood-based industries in India.<br>Overview of timber production, both roundwood and engineered wood. | 16 |

| | | |
|---|---|---|
| | National and international trade in primary timber species.<br>Status of wood and wood panel industries in India and globally.<br>Different forest-based industries: Paper, Pulp, Furniture, Bamboo, and more. | |
| II | **Wood Conversion and Processing Techniques**<br>Primary conversion methods and sawing techniques.<br>Wood machining tools: Parting, Slicing, Shaping, Measuring.<br>Stages in wood working and wood joinery.<br>Veneer production: Types, uses, grading, and storage.<br>Modern technologies in furniture making, including CNC. | 16 |
| III | **Wood Composites and Modification Techniques**<br>Production and applications of plywood, particle board, MDF, etc.<br>Types of laminates: Matte, Textured, Gloss, PVC, Acrylic, and Bamboo.<br>Eco-friendly composites: Lignocellulosic, Wood-Plastic, and Nano-based.<br>Chemical and thermal wood modification: Acetylation, Furfurylation, and more.<br>Bioactive composites and wood polymer production. | 16 |
| IV | **Wood Industry & Composites**<br>Industry Visits: Explore sawmills, pulp/paper, furniture, plywood, and briquette industries.<br>Wood Products: Study Particle board, MDF, Laminated Wood, and finishes like PVC, Acrylic.<br>Composites: Learn about Wood Plastic and Inorganic Composites (WPCs, WIC).<br>Wood Modification: Understand chemical and nanomaterial modifications for enhanced properties. | 16 |
| | **Total** | 64 |

**Textbooks:**


1. Baldwin, R. F. 1981. Plywood manufacturing practices. Revised 2nd edn. Miller and Freeman Publication, Inc. USA. 388p.
2. FRI [Forest Research Institute]. 1976. Indian forest utilization. Volume I and II. Forest Research Institute and colleges, Dehradun. 941p.
3. Hoadley, B. 2000. Understanding Wood: A Craftsman's guide to wood technology. Taunton Press. Newtown, USA. 223p.


**Reference Books:**


1. Buongiorno, J., Zhu, S., Zhang, D., Turner, J., & Tomberlin, D. (2003). The global forest products model: structure, estimation, and applications. Elsevier.
2. Shackleton, C. M., Pandey, A. K., & Ticktin, T. (2015). Ecological sustainability for non-timber forest products. Milton Park: Taylor & Francis.


| **Paper Minor** | **Research Methodology**<br>**L-T-P-C: 3-1-0-4 Credit Unit: 4 Evaluation Scheme: T** | **Course Code FOR142N801** |
|---|---|---|

**Course Objective:**

This course aims to provide students with the basic principles and methods of research in forestry, enabling them to understand research design, data collection, analysis, and report writing in a simple and practical manner.

**Course Outcome:**

| **On successful completion of the course, the students will able to:** | **Bloom's cognitive level** |
|---|---|

| | | |
|---|---|---|
| CO1 | Understand the fundamental concepts and types of research relevant to forestry | BT 1 |
| CO2 | Identify the basic research problems and hypotheses in forestry studies. | BT 2 |
| CO3 | Apply simple data collection and basic analysis techniques in field-based research. | BT 3 |
| CO4 | Evaluate modern wood modification techniques for industry applications. | BT 4 |

**Detailed Syllabus**

| Modules | **Title of Unit and Contents** | **Hours** |
|---|---|---|
| I | **Introduction to Research**<br>Definition, objectives and importance of research in forestry<br>Types of research: Basic, applied, and action research<br>Research ethics and plagiarism<br>Characteristics of good research | 16 |
| II | **Research Design and Hypothesis**<br>Steps in research process<br>Identification of research problem and setting objectives<br>Hypothesis: Meaning, types and formulation<br>Review of literature: Importance and sources | 16 |
| III | **Data Collection and Analysis**<br>Types of data: Primary and secondary<br>Sampling methods (random, stratified, purposive – simplified)<br>Basic tools for data collection: questionnaire, interview, observation<br>Introduction to simple statistical tools: mean, median, mode, percentage, standard deviation | 16 |
| IV | **Report Writing and Presentation**<br>Structure of a research report (Title, Introduction, Methodology, Results, Discussion, Conclusion)<br>Referencing styles (APA/Harvard – basic overview)<br>Tables and figures: basic guidelines<br>Presentation of findings: oral and poster presentation basics | 16 |
| | **Total** | 64 |

**Textbooks:**


1. Kangas, A., & Maltamo, M. (Eds.). (2006). Forest inventory: methodology and applications (Vol. 10). Springer Science & Business Media.
2. National Research Council, Division on Earth, Life Studies, Commission on Life Sciences, & Committee on Forestry Research. (1990). Forestry research: a mandate for change. National Academies Press.


**Reference Books:**


1. Chandra, G., Nautiyal, R., & Chandra, H. (Eds.). (2020). *Statistical methods and applications in forestry and environmental sciences*. Springer.
2. Jayaraman, K. (2000). A statistical manual for forestry research.