



ROYAL SCHOOL OF LIFE SCIENCES (RSLSC)

**COURSE STRUCTURE & SYLLABUS (BASED ON NATIONAL
EDUCATION POLICY 2020)**

FOR

**B.Sc. IN FORESTRY
(4 YEARS SINGLE MAJOR)**

W.E.F

AY – 2024-25

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Preamble

The National Education Policy (NEP) 2020 conceives a new vision for India's higher education system. It recognizes that higher education plays an extremely important role in promoting equity, human as well as societal well-being and in developing India as envisioned in its Constitution. It is desired that higher education will significantly contribute towards sustainable livelihoods and economic development of the nation as India moves towards becoming a knowledge economy and society.

Over the past decades the higher education system of our country has undergone substantial structural and functional changes resulting in both quantitative and qualitative development of the beneficiaries. The upgradation of undergraduate programmes will play an extremely important role in promoting human as well as societal well-being and in developing India as envisioned in its Constitution - a democratic, just, socially conscious, cultured, and humane nation upholding liberty, equality, fraternity, and justice for all. A holistic and multidisciplinary education would aim to develop all capacities of human beings -intellectual, aesthetic, social, physical, emotional, and moral in an integrated manner. As part of this holistic education, students will also be provided with opportunities for internships with local industries, businesses, artists, crafts persons, and so on, as well as research internships with faculty and researchers at the University, so that students may actively engage with the practical aspects of their learning and thereby improve their employability. The learning outcome-based curriculum in general and in **Forestry** in particular will definitely help the teachers of the discipline to visualize the curriculum more specifically in terms of the learning outcomes expected from the students at the end of the instructional process. It is pertinent to mention here that the purpose of education is to develop an integrated personality of the individual and the educational system provides all knowledge and skills to the learner for this.

As per the recommendations from the UGC, introduction of courses related to Indian Knowledge System (IKS) is being incorporated in the curriculum structure which encompasses all of the systematized disciplines of Knowledge which were developed to a high degree of sophistication in India from ancient times and all of the traditions and practises that the various communities of India—including the tribal communities—have evolved, refined and preserved over generations, like for example Plant Sciences in Ancient time, Vedic Mathematics, Vedangas, Metallurgy, etc.

At RGU, we are committed that at the societal level, higher education will enable each student to develop themselves to be an enlightened, socially conscious, knowledgeable, and skilled citizen who can find and implement robust solutions to its own problems. The programme structure developed has the provision of ensuring the integrated personality of the students in terms of providing opportunity for exposure to the students towards core courses, discipline specific courses, generic elective courses, ability enhancement courses and skill enhancement courses with special focus on technical, communication and subject specific skills through practical and other innovative transactional modes to develop their employability skills. This learning outcome-based framework has categorically mentioned very well-defined expected outcomes for the programme like core competency, communication skills, critical thinking, affective skills, problem-solving, analytical, reasoning, research-skills, teamwork, digital literacy, moral and ethical awareness, leadership readiness and so on along with very specific learning course outcomes at the starting of each course. Therefore, this template on Learning Outcomes based NEP-NCrF Framework for B.Sc. with Forestry/ Forestry Honours will be more flexible, multi- disciplinary, holistic and will definitely be a landmark in the field of outcome-based curriculum construction.

1. Introduction

The National Education Policy (NEP) 2020 clearly indicates that higher education plays an extremely important role in promoting human as well as societal well-being in India. It highlights that the following fundamental principles that have a direct bearing on the curricula would guide the education system at large, viz.

- i. Recognizing, identifying, and fostering the unique capabilities of each student to promote her/his holistic development.
- ii. Flexibility, so that learners can select their learning trajectories and programmes, and thereby choose their own paths in life according to their talents and interests.
- iii. Multidisciplinary and holistic education across the sciences, social sciences, arts, humanities, and sports for a multidisciplinary world.
- iv. Emphasis on conceptual understanding rather than rote learning, critical thinking to encourage logical decision-making and innovation; ethics and human & constitutional values, and life skills such as communication, teamwork, leadership, and resilience.
- v. Extensive use of technology in teaching and learning, removing language barriers, increasing access for Divyang students, and educational planning and management.
- vi. Respect for diversity and respect for the local context in all curricula, pedagogy, and policy.

To house the objectives of NEP – 2020, the new course structure of **BSc in Forestry** aims at a new and forward-looking Vision for India's Higher Education System. This curriculum framework for the bachelor-level program in Forestry is developed keeping in view of the student-centric learning pedagogy, which is entirely multidisciplinary, outcome-oriented, and curiosity-driven. To avoid rote-learning approach and foster imagination, the curriculum is more leaned towards self-discovery of concepts. The curriculum framework focuses on a pragmatist approach whereby practical application of theoretical concepts is taught with substantial coverage of practical and field works. The platform aims at equipping the graduates with necessary skills for Forestry-related careers, careers with general graduate-level aptitude and for higher education in Forestry and allied subjects. Augmented in this framework are graduate attributes including critical thinking, basic psychology, scientific reasoning, moral ethical reasoning and so on, qualification descriptors that are specific outcomes pertinent to the discipline of Forestry, learning outcomes for the two programmes these frameworks have been developed, learning outcomes for individual courses, pedagogical methods and assessment methods. Looking at all these new concepts and progress, the detailed syllabus of BSc (H) – Forestry has been designed and decided to be implemented from the academic session 2023-24.

2. Approach to Curriculum Planning

While designing these frameworks, emphasis is given on the objectively measurable teaching-learning outcomes to ensure employability of the graduates. In line with recent trends in education sector, these frameworks foster implementation of modern pedagogical tools and concepts such as flip-class, hybrid learning, MOOCs and other e-learning platforms. In addition, the framework is pragmatic to the core; it

is designed such a way to enable the learners implementing the concepts to address the real-world problems. A major emphasis of these frameworks is that the curriculum focuses on issues pertinent to India and also of the west; for example, biodiversity and conservation of endemic and threatened species that are found in India, Indian climatological variables, Indian biodiversity and so on. Above all, these frameworks are holistic and aim to mould responsible Indian citizen who have adequate skills in reflective thinking, rational skepticism, scientific temper, digital literacy and so on such that they are equipped to fight immediate social issues apropos to Indian milieu, including corruption and inequity.

The fundamental premise underlying the learning outcomes-based approach to curriculum planning and development is that higher education qualifications such as a Bachelor's Degree (Hons) programmes are earned and awarded on the basis of (a) demonstrated achievement of outcomes (expressed in terms of knowledge, understanding, skills, attitudes and values) and (b) academic standards expected of graduates of a programme of study.

Learning outcomes-based frameworks in any subject must specify what graduates completing a particular programme of study are (a) expected to know, (b) understand and (c) be able to do at the end of their programme of study. To this extent, NEP in Forestry is committed to allowing for flexibility and innovation in (i) programme design and syllabi development by higher education institutions (HEIs), (ii) teaching-learning process, (iii) assessment of student learning levels, and (iv) periodic programme review within institutional parameters as well as NEP guidelines, (v) generating framework(s) of agreed expected graduate attributes, qualification descriptors, programme learning outcomes and course learning outcomes. HEIs, on their turn, shall address to the situations of their students by identifying relevant and common outcomes and by developing such outcomes that not only match the specific needs of the students but also expands their outlook and values.

3. Award of Bachelor's Degree Programme in Forestry (Honours)

The structure and duration of undergraduate programmes of study offered by the University as per NEP 2020 include:

3.1 Undergraduate programmes of either 3 or 4-year duration with Single Major, with multiple entry and exit options, with appropriate certifications:

- A. **UG Certificate:** Students who opt to exit after completion of the first year and have secured 40 credits will be awarded a UG certificate if, in addition, they complete one vocational course of 4 credits during the summer vacation of the first year. These students are allowed to re-enter the degree programme within three years and complete the degree programme within the stipulated maximum period of seven years.
- B. **UG Diploma:** Students who opt to exit after completion of the second year and have secured 80 credits will be awarded the UG diploma if, in addition, they complete one vocational course of 4 credits during the summer vacation of the second year. These students are allowed to re-enter within a period of three years and complete the degree programme within the maximum period of seven years.
- C. **3-year UG Degree:** Students who will undergo a 3-year UG programme will be awarded UG Degree in the Major discipline after successful completion of three years, securing 120 credits and satisfying the minimum credit requirement.
- D. **4-year UG Degree (Honours):** A four-year UG Honours degree in the major discipline will be awarded to those who complete a four-year degree programme with 160 credits and have satisfied the credit requirements as given in Table 6 in Section 5.
- E. **4-year UG Degree (Honours with Research):** Students who secure 75% marks and above in the first six semesters and wish to undertake research at the undergraduate level can choose a research stream in the fourth year. They should do a research project or dissertation under the guidance of a Faculty Member of the University. The research project/dissertation will be in the major discipline. The students who secure 160 credits, including 12 credits from a research project/dissertation, will be awarded UG Degree (Honours with Research).

(Note: UG Degree Programmes with Single Major: A student must secure a minimum of 50% credits from the major discipline for the 3-year/4-year UG degree to be awarded a single major. For example, in a 3-year UG programme, if the total number of credits to be earned is 120, a student of Forestry with a minimum of 60 credits will be awarded a B.Sc. in Forestry with a single major. Similarly, in a 4-year UG programme, if the total number of credits to be earned is 160, a student of Forestry with a minimum of 80 credits will be awarded a B.Sc. (Hons. /Hon. With Research) in Forestry in a 4-year UG programme with single major. Also, the 4-year Bachelor's degree programme with Single Major is considered as the preferred option since it would allow the opportunity to experience the full range of holistic and multidisciplinary education in addition to a focus on the chosen major and minors as per the choices of

the student.)

A student pursuing 4 years undergraduate programme with research in a specific discipline shall be awarded an appropriate Degree in that discipline on completion of 8th Semester if he/she secures 160 Credits. An illustration of credits requirements in relation to the type of award is illustrated below:

Table: 1: Award of Degree and Credit Structure with ME-ME

Award	Year	Credits to earn	Additional Credits	Re-entry allowed within (yrs)	Years to Complete
UG Certificate	1	40	4	3	7
UG Diploma	2	80	4	3	7
3-year UG Degree (Major)	3	120	x	x	x
4-year UG Degree (Honours)	4	160	x	x	x
4-year UG Degree (Honours with Research):	4	160	Students who secure cumulative 75% marks and above in the first six semesters		

Table 2: Credit Distribution for 3-year Course Semester

Course Credits								
Semester	Major	Minor	ID	AEC	SEC	VAC	SI	Total
I	6	3	3	2	3	3	0	20
II	6	3	3	2	3	3	0	20
III	8	4	3	2	3	0	0	20
IV	12	6	0	2	0	0	0	20
V	12	4	0	0	0	0	4	20
VI	16	4	0	0	0	0	0	20
TOTAL	60	24	9	8	9	6	4	120

Table 3: Credit Distribution for 4-year Course Semester

Course Credits									
Semester	Major	Minor	ID	AEC	SEC	VAC	SI	RP	Total
I	6	3	3	2	3	3	0	0	20
II	6	3	3	2	3	3	0	0	20
III	8	4	3	2	3	0	0	0	20
IV	12	6	0	2	0	0	0	0	20
V	12	4	0	0	0	0	4	0	20
VI	16	4	0	0	0	0	0	0	20

VII	16	4	0	0	0	0	0	0	20
VIII	4	4	0	0	0	0	0	12	20
TOTAL	80	32	9	8	9	6	4	12	160

Bachelor's Degree (Honours) is a well-recognized, structured, and specialized graduate level qualification in tertiary, collegiate education. The contents of this degree are determined in terms of knowledge, understanding, qualification, skills, and values that a student intends to acquire to look for professional avenues or move to higher education at the postgraduate level.

Bachelor's Degree (Honours) programmes attract entrants from the secondary level or equivalent, often with subject knowledge that may or may not be directly relevant to the field of study/profession. Thus, BSc (Honours) Course in Forestry aims to equip the students to qualify for joining a profession or to provide development opportunities in particular employment settings. Graduates are enabled to enter a variety of jobs or to continue academic study at a higher level.

3.1 Aims of Bachelor's Degree (Honours) Programme in Forestry:

The overall objectives of the NEP Framework for B.Sc.- Honours degree in Forestry are-

1. To impart the basic knowledge of Plant Sciences with theories, principles, processes, and studies of traditional and modern Forestry.
2. To impart more multi-disciplinary and holistic course curriculum.
3. To develop the learners providing research-based knowledge
4. To equip the students in solving the practical problems pertinent to India
5. To adopt recent pedagogical trends in education including e-learning, flipped class, hybrid learning and MOOCs
6. To mould responsible citizen for nation-building and transforming the country towards the future
7. To provide an environment that ensures cognitive development of students in a holistic manner. A dialogue about plants and its significance is fostered in this framework, rather than didactic monologues on mere theoretical aspects
8. To provide the latest subject matter, both theoretical as well as practical, such a way to foster their core competency and discovery learning. A Forestry graduate as envisioned in this framework would be sufficiently competent in the field to undertake further discipline-specific studies, as well as to begin domain-related employment.
9. To mould a responsible citizen who is aware of most basic domain-independent knowledge, including critical thinking and communication.
10. To enable the graduate prepare for national as well as international competitive examinations, especially UGC-CSIR NET and UPSC Civil Services Examination

4. Graduate Attributes & Learning

Outcomes Introduction:

As per the NHEQF, each student on completion of a programme of study must possess and demonstrate the expected Graduate Attributes acquired through one or more modes of learning, including direct in-person or face- to-face instruction, online learning, and hybrid/blended modes. The graduate attributes indicate the quality and features or characteristics of the graduate of a programme of study, including learning outcomes relating to the disciplinary area(s) relating to the chosen field(s) of learning and generic learning outcomes that are expected to be acquired by a graduate on completion of the programme(s) of study.

The graduate profile/attributes must include,

- capabilities that help widen the current knowledge base and skills,
- gain and apply new knowledge and skills,
- undertake future studies independently, perform well in a chosen career, and
- play a constructive role as a responsible citizen in society.

The graduate profile/attributes are acquired incrementally through development of cognitive levels and describe a set of competencies that are transferable beyond the study of a particular subject/disciplinary area and programme contexts in which they have been developed.

Graduate attributes include,

- learning outcomes that are specific to disciplinary areas relating to the chosen field(s) of learning within broad multidisciplinary/interdisciplinary/ transdisciplinary contexts.
- generic learning outcomes that graduate of all programmes of study should acquire and demonstrate.

Sl. No.	Graduate Attribute	The Learning Outcomes Descriptors <i>(The graduates will be able to demonstrate the capability to:</i>
GA1	Disciplinary Knowledge	acquire knowledge and coherent understanding of the broad discipline encompassing various subjects involved with the study of plants in both disciplinary and interdisciplinary areas of study.
GA 2	Complex problem solving	solve different kinds of problems in familiar and non-familiar contexts and apply the learning to real-life situations.
GA 3	Analytical & Critical thinking	apply analytical thought including the analysis and evaluation of policies, and practices. Able to identify relevant assumptions or implications. Identify logical flaws and holes in the arguments of others. Analyse and synthesize data from a variety of sources and draw valid conclusions and support them with evidence and examples.
GA 4	Creativity	create, perform, or think in different and diverse ways about the same objects or scenarios and deal with problems and situations that do not have simple solutions. Think 'out of the box' and generate solutions to complex problems in unfamiliar contexts by adopting innovative, imaginative, lateral thinking, interpersonal skills, and emotional intelligence.
GA 5	Communication Skills	listen carefully, read texts and research papers analytically, and present complex information in a clear and concise manner to different groups/audiences. Express thoughts and ideas effectively in writing and orally and communicate with others using appropriate media.
GA 6	Research-related skills	develop a keen sense of observation, inquiry, and capability for asking relevant/ appropriate questions. Should acquire the ability to problematize, synthesize and articulate issues and design research proposals, define problems, formulate appropriate and relevant research questions, formulate hypotheses, test hypotheses using quantitative and qualitative data, establish hypotheses, make

		inferences based on the analysis and interpretation of data, and predict cause-and-effect relationships. Should develop the ability to acquire the understanding of basic research ethics and skills in practicing/doing ethics in the field/ in personal research work.
GA 7	Collaboration	work effectively and respectfully with diverse teams in the interests of a common cause and work efficiently as a member of a team.
GA 8	Leadership readiness/qualities	plan the tasks of a team or an organization and setting direction by formulating an inspiring vision and building a team that can help achieve the vision.
GA 9	Digital and technological skills	use ICT in a variety of learning and work situations. Access, evaluate, and use a variety of relevant information sources and use appropriate software for analysis of data.
GA 10	Environmental awareness and action	mitigate the effects of environmental degradation, climate change, and pollution. Should develop the technique of effective waste management, conservation of biological diversity, management of biological resources and biodiversity, forest and wildlife conservation, and sustainable development and living.

5 Program Learning Outcomes relating to BSc Forestry (Honours) degree Programme in Forestry:

The student graduating with the Degree B.Sc. (Honours) Forestry should be able to acquire

Sl.no.	Graduate Attribute	The Programme Learning Outcomes Descriptors <i>The graduates will acquire the following:</i>
PLO1:	Knowledge of Forestry	<p>Students will acquire core competency in the subject Forestry, and in allied subject areas.</p> <ul style="list-style-type: none"> • The student will be able to identify major groups of plants and compare the characteristics of lower (e.g. algae and fungi) and higher (angiosperms and gymnosperms) plants. • Students will be able to use the evidence based comparative Forestry approach to explain the evolution of organism and understand the genetic diversity on the earth. • The students will be able to explain various plant processes and functions, metabolism, concepts of gene, genome and how organism's function is influenced at the cell, tissue and organ level. • Students will be able to understand adaptation, development and behaviour of different forms of life. • The understanding of networked life on earth and tracing the energy pyramids through nutrient flow is expected from the students. • Students will be able to demonstrate the experimental techniques and methods of their area of specialization in Forestry.
PLO2:	Problem solving ability:	<p>An increased understanding of fundamental concepts and their applications of scientific principles is expected at the end of this course.</p> <p>Students will acquire problem solving capabilities.</p>
PLO3:	Critical Thinking and Analytical ability:	<p>The students will be able to Analyse and synthesize data from a variety of sources and draw valid conclusions and support them with evidence and examples. They will be able to identify relevant assumptions or implications, identify logical flaws and holes in the arguments of others.</p>
PLO4	Creativity:	<p>The students will be able to think 'out of the box' and generate solutions to complex problems in unfamiliar contexts by adopting innovative, imaginative, lateral thinking, interpersonal skills, and emotional intelligence.</p>
PLO5:	Communication Skills:	<p>The students will be express their thoughts and ideas effectively in writing as well as orally and communicate with others using appropriate media.</p>

PLO6:	Research ability:	Students will develop the ability to acquire the understanding of basic research ethics and skills in practicing/doing ethics in the field/ in personal research work.
PLO7:	Collaborative ability:	Students will learn team workmanship in order to serve efficiently institutions, industry and society. Will be able to develop collaborative ability.
PLO8:	Leadership ability:	The students will be able to build a team to achieve the vision, plan a task and execute it.
PLO9:	Digitally equipped:	Students will acquire digital skills and integrate the fundamental concepts with modern tools.
PLO10:	Environmental awareness:	Will be able to develop the technique of effective waste management, conservation of biological diversity, management of biological resources and biodiversity, forest and wildlife conservation, and sustainable development and living.

6. Programme Specific Outcomes (PSOs)

PSO1. A student completing the course is able to understand different specializations of Forestry such as systematics, evolution, ecology, developmental biology, physiology, biochemistry, plant interactions with microbes and insects, morphology, anatomy, reproduction, genetics and molecular biology of various life-forms.

PSO2. The student completing the course is trained in various analytical techniques of plant biology, use of plants as industrial resources or as human livelihood support system and is well versed with the use of transgenic technologies for basic and applied research in plants.

PSO3. The student completing the course is able to identify various life forms of plants, design and execute experiments related to basic studies on evolution, ecology, developmental biology, physiology, biochemistry, plant interactions with microbes and insects, morphology, anatomy, reproduction, genetics, microbiology, molecular biology, recombinant DNA technology, proteomics and transgenic technology. Students are also familiarized with the use of bioinformatics tools and databases and in the application of statistics to biological data.

PSO4. The student completing the course is capable of executing short research projects incorporating various tools and techniques in any of the basic specializations of Plant Sciences under supervision.

6. Teaching Learning Process

Teaching and learning in this programme involve classroom lectures, tutorials, Practicums and experiential learnings:

It allows-

- The tutorials allow a closer interaction between the students and the teacher as each student gets individual attention.
- Written assignments and projects submitted by students
- the project-based learning
- Group discussion
- Home assignments
- Quizzes and class tests
- PPT presentations, Seminars, interactive sessions
- Diversity survey
- Co-curricular activity etc.
- Industrial Tour or Field visit

7. Assessment Methods

Sl. No.	Components of evaluation	Marks	Frequency	Code	Weightage (%)
A.	Continuos Evaluation				

i.	Analysis/ Class Test	Combination of any 3 from I to	1 – 3	C	25%
ii	Home assignments	V with 5 marks each	1 – 3	H	
iii	Project		1	P	
iv	Seminar		1 – 2	S	
v	Viva-Voce/ Presentations		1 – 2	V	
vi	Mid semester Examinations	MSE shall be of 10 marks	1	Q/CT	
vii	Attendance	5 marks	100%	A	5%
B.	Semester End examination		1	SEE	70%
Total					100%

B.SC. FORESTRY PROGRAMME STRUCTURE				
1ST SEMESTER				
MAJOR SUBJECTS				
Sl.No	Subject Code	Names of subjects	C	Course level
MAJOR SUBJECTS				
1	M101	Forest ecology	3	100
2	M112	Forest ecology practical	3	100
MINOR SUBJECTS				
3	N101	Basics of Forest Ecology	3	100
INTERDISCIPLINARY SUBJECTS				
4		IKS 1	3	100
SKILL ENHANCEMENT COURSE (SEC)				
5	S121	Plant Disease: Identification and control	3	100
ABILITY ENHANCEMENT COURSES (AEC)				
6	AEC982A101	Communicative English I	1	100
7		Behavioral Science-I	1	100
VALUE ADDED COURSE (VAC)				
8	VAC 1	One course from a basket of available courses to be selected	3	100
TOTAL CREDITS FOR THE SEMESTER			20	

2ND SEMESTER				
Sl. No.	Subject Code	Names of subjects	C	Course Level
MAJOR SUBJECTS				
1	M201	Forest systematics & ethnobiology	3	100
2	M212	Forest systematics & ethnobiology Practical	3	100
MINOR SUBJECT				
3	N201	Forest Taxonomy & ethnobiology	3	100
INTERDISCIPLINARY SUBJECT				
4	IDC - 2	IKS - 2	3	100
SKILL ENHANCEMENT COURSE (SEC)				
5	S221	Plant Identification and Herbarium Techniques	3	100
ABILITY ENHANCEMENT COURSE (AEC)				
6	AEC982A201	Communicative English and Behavioral Science-II	2	100
VALUE ADDED COURSE (VAC)				
7	VAC 2	One course from a basket of available courses to be selected	3	100
TOTAL CREDITS FOR THE SEMESTER			20	

3RD SEMESTER				
Sl.No	Subject Code	Names of subjects	C	Course level
MAJOR SUBJECTS				
1	M301	Forest resources and services	4	200
2	M312	Forest resources and services - practical	4	200
MINOR SUBJECT				
3	N301		4	200
INTERDISCIPLINARY SUBJECT				
4	IDC 3	Basket course	3	200
SKILL ENHANCEMENT COURSE (SEC)				
5	S321		3	200
ABILITY ENHANCEMENT COURSE (AEC)				
6	AEC982A301	Communicative English and Behavioral Science-III	2	200
TOTAL CREDITS FOR THE SEMESTER			20	
4TH SEMESTER				
Sl.No	Subject Code	Names of subjects	C	Course level
MAJOR SUBJECTS				
1	M401	Forest biometry	3	200
2	M402	Forest legislation & policies	3	200
3	M403	Forest management in ancient india	3	
4	M414	Forest biometry, legislation, policies, and Forest management Practical	3	200
MINOR SUBJECTS				
4	N401		3	200
5	N402		3	200
ABILITY ENHANCEMENT COURSE (AEC)				
6	AEC982A401	Communicative English and Behavioral Science-IV	2	200
TOTAL CREDITS FOR THE SEMESTER			20	

5th SEMESTER				
Sl.No	Subject Code	Names of subjects	C	Course level
MAJOR SUBJECTS				
1	BOT142M501	Principles of Silviculture	4	300
2	BOT142M502	Wildlife management and ecotourism	4	300
3	BOT142M513	Silviculture, Wildlife management and ecotourism - Practical	4	300
MINOR SUBJECT				
4	N501		4	300
INTERNSHIP/ RESEARCH PROJECT				
5	M521	Internship/ Research Project	4	300
TOTAL CREDITS FOR THE SEMESTER			20	
6th SEMESTER				
Sl.No	Subject Code	Names of subjects	C	Course level
MAJOR SUBJECTS				
1	M601	Forest Geoinformatics	4	300
2	M602	Forest genetics and tree improvement	4	300
3	M603	Advances in forest management	4	300
4	M614	Forest geoinformatics, genetics, tree improvement - Practical	4	300
MINOR SUBJECTS				
5	N601		4	300
TOTAL CREDITS FOR THE SEMESTER			20	

7TH SEMESTER				
Sl.No	Subject Code	Names of subjects	C	Course level
MAJOR SUBJECTS				
1	M701	Wood science & technology	4	400
2	M702	Climate change & forestry	4	400
3	M703	Medicinal & aromatic plants	4	400
4	M714	Wood science, climate change, forestry, medicinal & aromatic plants - Practical	4	400
MINOR SUBJECTS				
5	N701		4	400
TOTAL CREDITS FOR THE SEMESTER			20	
8TH SEMESTER				
Sl.No	Subject Code	Names of subjects	C	Course level
MAJOR SUBJECTS				
1	M801	Forest biology & tree physiology	4	400
MINOR SUBJECTS				
2	N801	Research Methodology	4	400
DISSERTATION/ RESEARCH PROJECT				
3	M821	DISSERTATION	12	400
IN LIU OF DISSERTATION				
4	M802	Reproductive biology & breeding methods	4	400
5	M803	Tree seed technology	4	400
6	M804	Nursery techniques & plantation techniques	4	400
TOTAL CREDITS FOR THE 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
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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.	
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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 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. 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. 2. Study of microclimate and forest soils. 3. Study of ecological modifications of leaves.	14
III	1. Effects of fire on forest ecosystem 2. Study of population dynamics using model systems 3. Preparation of life tables 4. Study of spatial dispersion among plants	14
IV	1. Study of Forest composition 2. Study of succession in field/water bodies. 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.

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 Distributors. 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	
Subject Code: BOT142S121	L-T-P-C: 0-0-3-3,
Credit Units: 03	
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

Scheme of Evaluation: Theory

Course Objective: The course is designed to provide basic knowledge of taxonomy in relation to forest and also to familiarize them 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

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.

Semester-I	
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 plant identification.	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. Digital/virtual herbarium: Introduction and importance of digital herbaria. Practical/ Project based on the syllabus.	24
Total		90

CREDIT DISTRIBUTION		
LECTURE/TUTORIAL	PRACTICALS	EXPERIENTIAL LEARNING

00	60	30
		<ul style="list-style-type: none"> • FIELD VISITS • SAMPLE COLLECTION • 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.

