KANNUR UNIVERSITY

(Abstract)

M.Sc Forestry Programme- Scheme , Syllabus, Pattern of Question papers and Model Question papers under Choice Based Credit and Semester System (Outcome Based Education system- OBE) in Affiliated Colleges -Implemented with effect from 2023 admissions - Orders issued.

ACADEMIC C SECTION

Acad/C2/18555/Forestry(PG) /2022 Dated: 11.11.2023

Read:-1.Go. (MS) No.391/2022/HEDN dated 11.08.2022

2. U.O. No. Acad/ASo A2/14713/2022 dt 29.11.2022

3. Syllabus submitted by the Director, MVR Snake Park & Zoo vide letter No.MVRSPZ/MILSR/10-03 dtd.19.10.2022

4.Acad/C2/18555/Forestry(PG)/2022 dated 11.01.2023.

5. Remarks furnished by the subject expert vide e- mail dtd.05.05.2023.

6. Letter No.18555/Forestry(PG)/2022 dtd.01.06.2023.

7. Letter no. MVRILSRS/2023/CR/10-06 dated 01.06.2023

8. Syllabus submitted by the Expert committee Chairman vide e-mail dated 16.10.2023

9. Orders of Vice Chancellor in file of even No. dated 06.11.2023

ORDER

1. As per paper read (1) above sanction has been accorded by the Government, to start M.Sc Forestry programme (CBCSS) at MVR institute of Life Sciences & Research studies, Parassinikadavu, Kannur and University has granted provisional affiliation for the same vide paper read (2) above.

2. In the circumstance of non existence of Board of studies and considering the exigency of the matter, Vice Chancellor has ordered to prepare the syllabus of the programme, to the college authorities and the Director, MVR Snake Park & Zoo, Parassinikkadavu, Kannur vide paper read 3 above forwarded the draft Scheme and Syllabus of M.Sc Forestry programme.

3. The draft syllabus of MSc Forestry programme submitted by the college authorities has been forwarded (vide paper read 4) to the subject expert Sri. Aneesh K S, Assistant Professor, Department of Natural Resource Management, College of Forestry, Vellanikkara, Kerala Agriculture University, Thrissur, to scrutinize and furnish valuable remarks.

4. The subject expert after verification, recommended (Paper read 5 above) a major revision in the syllabus and courses and also recommended to constitute a committee to draft the syllabus with faculties from forestry background for this purpose.

5. In the absence of Board of studies, in the University, the college authorities were directed (vide Paper read 6 above) to constitute a committee with faculties from forestry background to draft the syllabus of M.Sc Forestry programme (CBCSS). Consequently, the college authorities constituted a committee to draft the syllabus with faculties from forestry background vide paper read (7) above,

6. Subsequently, the expert committee, reframed the syllabus, based on the remarks furnished by the subject expert and also in accordance with the PG regulation 2023 of Affiliated colleges and Convenor of expert committee submitted the draft scheme, syllabus, Pattern of Question papers and Model Question papers of M.Sc Forestry programme under Choice Based Credit and Semester System (in OBE- Outcome Based Education System) in Affiliated Colleges for implementation w.e.f 2023 admission, vide paper read 8 above.

7. The Vice Chancellor, after considering the matter in detail and in exercise of the powers of the Academic Council conferred under section 11(1) Chapter III of Kannur University Act, 1996 and all other enabling provisions read together with, ***accorded sanction to implement the Scheme, Syllabus, Pattern of Question Papers and Model Question Papers of M.Sc Forestry programme under Choice Based Credit and Semester System (in OBE- Outcome Based Education System) in Affiliated Colleges under the University w.e.f 2023 admission , subject to report to the Academic Council.***

8.The Scheme, Syllabus, Pattern of Question papers and Model question papers of M.Sc Forestry programme under Choice Based Credit and Semester System (in OBE- Outcome Based Education System) in Affiliated Colleges under the University w.e.f 2023 admission is uploaded in the University website.

9. Orders are issued accordingly.

Sd/-
Narayanadas K
DEPUTY REGISTRAR (ACAD)
For REGISTRAR

To:
1. The Principal, MVR Institute of Life science & Research Studies.
2. Convener, Curriculum Syllabus Monitoring committtee.
3. Convenor, Expert committee for the revision of MSc Forestry Syllabus

Copy To:
1. The Examination Branch (Through PA to CE)
2. PS to VC / PA to PVC / PA to R/PA to FO
3. DR / AR 1 (Acad) / AR II Exam/SWC/Acad D/Computer Programmer
4. SF / DF /FC
5. IT Centre (for uploading on the website)
6. EP V Section.

Forwarded / By Order
SECTION OFFICER

KANNUR UNIVERSITY
CIVIL STATION P.O.
KANNUR
Pin-670 002
THAVAKKARA

KANNUR UNIVERSITY

Curriculum for Choice Based Credit and Semester System for Postgraduate Programme in Affiliated Colleges -2023

(OBE – Outcome Based Education – system)

Kannur University introduced Outcome Based Education (OBE) in the curriculum for under graduate students in 2019. Expanding OBE to the Postgraduate curriculum and syllabus from the academic year 2023 onwards demonstrates the university's commitment to further improving the learning experience for its students across different academic levels. This move is to enhance the academic rigour and relevance of the Postgraduate programmes, better preparing the students for their future careers and challenges.

Outcome based education is an educational methodology where each aspect of education is organized around a set of goals (outcomes). Students should achieve their goal by the end of the educational process. Throughout the educational experience, all students should be able to achieve their goals. It focuses on measuring student performance through outcomes. The OBE model aims to maximize student learning outcomes by developing their knowledge & skills.

The key to success in outcome-based education is clarity, for both teachers and students to understand what's expected of them. Outcome-based education aims to create a clear expectation of results that students must

achieve. Here, the outcome includes skills, knowledge and attitude. In addition to understanding what's expected, outcome-based education also encourages transparency. The basic principle of outcome-based education is that students must meet a specific standard to graduate. Hence, no curve grading is used in outcome-based education, and instead, teachers are free to experiment with any methodology they feel is best.

Mission statements

- To produce and disseminate new knowledge and to find novel avenues for application of such knowledge.
- To adopt critical pedagogic practices which uphold scientific temper, the uncompromised spirit of enquiry and the right to dissent.
- To uphold democratic, multicultural, secular, environmental and gender sensitive values as the foundational principles of higher education and to cater to the modern notions of equity, social justice and merit in all educational endeavours.
- To affiliate colleges and other institutions of higher learning and to monitor academic, ethical, administrative and infrastructural standards in such institutions.
- To build stronger community networks based on the values and principles of higher education and to ensure the region's intellectual integration with national vision and international standards.
- To associate with the local self-governing bodies and other statutory as well as non-governmental organizations for continuing education and also for building public awareness on important social, cultural and other policy issues.

Establishing the Programme Outcomes (POs)

Programme Outcomes (POs): Programme outcomes can be defined as the objectives achieved at the end of any specialization or discipline. These attributes are mapped while a student is doing graduation and determined when they get a degree.

PO 1. Advanced Knowledge and Skills: Postgraduate courses aim to provide students with in-depth knowledge and advanced skills related to their chosen field. The best outcome would be to acquire a comprehensive understanding of the subject matter and develop specialized expertise.

PO 2. Research and Analytical Abilities: Postgraduate programmes often emphasize research and analytical thinking. The ability to conduct independent research, analyze complex problems, and propose innovative solutions is highly valued.

PO 3. Critical Thinking and Problem-Solving Skills: Developing critical thinking skills is crucial for postgraduate students. Being able to evaluate information critically, identify patterns, and solve problems creatively are important outcomes of these programs.

PO 4. Effective Communication Skills: Strong communication skills, both written and verbal, are essential in various professional settings. Postgraduate programs should focus on enhancing communication abilities to effectively convey ideas, present research findings, and engage in academic discussions.

PO 5. Ethical and Professional Standards: Graduates should uphold ethical and professional standards relevant to their field. Understanding and adhering to professional ethics and practices are important outcomes of postgraduate education.

PO 6. Career Readiness: Postgraduate programs should equip students with the necessary skills and knowledge to succeed in their chosen careers. This includes practical skills, industry-specific knowledge, and an understanding of the job market and its requirements.

PO 7. Networking and Collaboration: Building a professional network and collaborating with peers and experts in the field are valuable outcomes. These connections can lead to opportunities for research collaborations, internships, and employment prospects.

PO 8. Lifelong Learning: Postgraduate education should instill a passion for lifelong learning. The ability to adapt to new developments in the field, pursue further education, and stay updated with emerging trends is a desirable outcome.

Establishing the Course Outcomes

Course Outcomes (COs) are the objectives that are achieved at the end of any semester/year. For instance, if a student is studying a particular course, then, the outcomes would be concluded on the basis of the marks or grades achieved in theory and practical lessons.

Each programme shall define the COs according to the outcome set at the beginning of the study of the course.

Automated Question Bank System

The evaluation process shall be based on the revised Bloom's Taxonomy. Hence the syllabus shall be defined and designed in view of the scheme of the said taxonomy.

Modules

The syllabus shall be prepared in four Modules to reflect the spirit of revised Blooms Taxonomy and the evaluation system based on the six cognitive levels.

Evaluation process using Revised Bloom's Taxonomy

There are six levels of cognitive learning according to the revised version of Bloom's Taxonomy. Each level is conceptually different. The six levels are remembering, understanding, applying, analysing, evaluating, and creating. These levels can be helpful in developing learning outcomes.

Remember: Definition: retrieve, recall, or recognize relevant knowledge from long-term memory. Appropriate learning outcome verbs for this level include: *cite, define, describe, identify, label, list, match, name, outline, quote, recall, report, reproduce, retrieve, show, state, tabulate, and tell.*

Understand: Definition: demonstrate comprehension through one or more forms of explanation. Appropriate learning outcome verbs for this level include: abstract, arrange, articulate, associate, categorize, clarify, classify, compare, compute, conclude, contrast, defend, diagram, differentiate, discuss, distinguish, estimate, exemplify, explain, extend, extrapolate, generalize, give examples of, illustrate, infer, interpolate, interpret, match, outline, paraphrase, predict, rearrange, reorder, rephrase, represent, restate, summarize, transform, and translate.

Apply: Definition: Use information or a skill in a new situation Appropriate learning outcome verb for this level include: apply, calculate, carry out, classify, complete, compute, demonstrate, dramatize, employ, examine, execute, experiment, generalize, illustrate, implement, infer, interpret, manipulate, modify, operate, organize, outline, predict, solve, transfer, translate, and use.

Analyze: Definition: break material into its constituent parts and determine how the parts relate to one another and/or to an overall structure or purpose Appropriate learning outcome verbs for this level include: analyse, arrange, break down, categorize, classify, compare, connect, contrast, deconstruct, detect, diagram, differentiate, discriminate, distinguish, divide, explain, identify, integrate, inventory, order, organize, relate, separate, and structure.

Evaluate: Definition: make judgments based on criteria and standards Appropriate learning outcome verbs for this level include: appraise, apprise, argue, assess, compare, conclude, consider, contrast, convince, criticize, critique, decide, determine, discriminate, evaluate, grade, judge, justify, measure, rank, rate, recommend, review, score, select, standardize, support, test, and validate.

Create: Definition: put elements together to form a new coherent or functional whole; reorganize elements into a new pattern or structure. Appropriate learning outcome verbs for this level include: arrange, assemble, build, collect, combine, compile, compose, constitute, construct, create, design, develop, devise, formulate, generate, hypothesize, integrate, invent, make, manage, modify, organize, perform, plan, prepare, produce, propose, rearrange, reconstruct, reorganize, revise, rewrite, specify, synthesize, and write.

KANNUR UNIVERSITY

Regulations for Choice Based Credit and Semester System for Postgraduate Programme in Affiliated Colleges -2023 (in OBE – Outcome Based Education – system)

1. TITLE, APPLICATION AND COMMENCEMENT

1.1 These regulations may be called "Kannur University Regulations for Choice Based Credit and Semester System for Postgraduate Programme 2023" (in OBE – Outcome Based Education – system) (KUCBCSSPG 2023)

1.2 The regulations provided herein shall apply to all regular Post-graduate programmes conducted in colleges and institutions affiliated to the Kannur University, coming under the Faculties of Science, Technology, Humanities, Social Sciences, Language & Literature, Commerce and

Management Studies, Fine Arts, Communication, and such other faculties as decided by the University from time to time .

1.3 These regulations shall come into force with effect from 2023 admission onwards.

1.4 The provisions herein shall supersede all the existing regulations for the regular Postgraduate programmes of affiliated colleges and institutions to the extent herein prescribed.

2. DEFINITIONS: In these regulations, unless the context otherwise requires:

2.1 '**Programme**' means a programme of study comprising of Core Course, Elective Course, Open Course and MOOC course as applicable.

2.2 '**Duration of Programme'** means the time period required for the conduct of the programme. The duration of a Post Graduate degree programme shall be four semesters with 18 weeks in a semester distributed over a period of two academic years in compliance with hours of instruction stipulated by UGC.

2.3 '**Semester**' means a term consisting of 90 working days including examination days.

2.4 **'Academic Week'** is a unit of five working days in which the distribution of work is organised from day one to day five (normally, Monday to Friday), with five contact hours of one-hour duration on each day. A sequence of 18 such academic weeks constitutes a semester.

2.5 **'Course'** means a segment of a programme limited to one semester in a subject.

2.6 **'Core Course'** means a compulsory course in a subject related to a particular postgraduate programme.

2.7 **'Elective Course'** means an optional course to be selected by a student out of such courses offered in the same Department.

2.8 **'Open Elective Course (Multidisciplinary)'** means an elective course which is available for students of all departments including students of the same department. Students of other departments may opt for these courses subject to fulfilling eligibility criteria as laid down by the department offering the course.

2.9 **'MOOC Course'** means Massive Open Online Course.

2.10 **'Improvement Course'** is a course registered by a student for improving her/his performance in that particular course.

2.11 **'Credit'** means the value assigned to a course which indicates the level of instruction. It is the measure of total number of hours of training received in a course during a week.

2.12 **'Credit Point' (CP) of a Course** is the value obtained by multiplying the grade point (GP) by the credit (C) of the course: **CP = GP x C**.

2.13 **'Credit Point' (CP) of a Semester is** the sum of credit points obtained by a student in various courses taken in a semester.

2.14 **'Semester Grade Point Average'** (SGPA) is the value obtained by dividing the sum of credit points obtained by a student in various courses taken in a semester by the total number of credits in that semester. SGPA shall be rounded off to three decimal places. SGPA determines the overall performance of a student at the end of a semester.

2.15 **'Cumulative Grade Point Average'** (CGPA) is the value obtained by dividing the sum of credit points in all the courses taken by the student for the completed semesters by the total number of credits acquired so far and shall be rounded off to three decimal places.

CGPA = Sum of the Credit Points secured in completed semesters/ Total Credit for the completed semesters

2.16 **'Overall Grade Point Average'** (OGPA) is the value obtained by dividing the sum of credit points in all the semesters taken by the student for the entire programme by the total number of credits in the entire programme and shall be rounded off to three decimal places. OGPA is the final grade point average after completing four semesters.

2.17 **'Grade Card'** means the official record of a student's performance, awarded to her/him. Each letter grade is assigned a **'Grade Point'** (GP) which indicates the numerical equivalent of the broad level of performance of a student in a course. **"Grade Point"** means a point given to a grade on the scale as provided under clause 7.2.

2.18 **'Letter Grade'** or simply 'Grade' in a course is a letter symbol (A^+, A, B, C, D, E, and F). Grade means the prescribed alphabetical grade

awarded to a student based on her/his performance in various examinations.

2.19 **'Repeat course'** is a course that is repeated by a student in a semester for want of sufficient attendance. She/ He can repeat the course whenever it is offered again. The student registered for repeat course need not attend the classes if she/he has satisfied the requirements regarding attendance.

2.20 **'Strike off the roll'**: means removing a student who is continuously absent for 14 days without sufficient reason and proper intimation to the Principal of the college from the roll after following the procedure prescribed.

2.21 **'College Council'** means the body of all Heads of the Departments and elected members among teachers as per the Kannur University Statutes.

2.22 **'College Co-ordinator'** is a teacher nominated by the college council to coordinate the effective running of CBCSS and the process of continuous evaluation undertaken by various departments within the college. She / he shall be nominated to the College level Grievance Redressal Cell.

2.23 **'Department'** means any teaching department in a college offering a programme/course of study approved by the University, as per the Statutes and Act of the University.

2.24 **'Parent Department'** means the Department that offers a particular degree programme.

2.25 **'Department Council'** means the body of all teachers of a department in a college.

2.26 '**Department Co-ordinator**' is a teacher nominated by the Department Council to co-ordinate the continuous evaluation process undertaken in that department.

2.27 '**Faculty Adviser**' means a teacher from the parent department nominated by the Department Council, who will advise the students in academic matters and in the choice of Generic Elective course.

2.28 Words and expressions used and not defined in these regulations, but defined in the Kannur University Act, Statutes and Ordinances shall have the meaning respectively assigned to them in the Act, the Statutes and the Ordinances.

3. PROGRAMME STRUCTURE

3.1 **Duration**: The duration of a Postgraduate programme shall be four semesters inclusive of days of examinations distributed over a period of two academic years. The odd semesters (1, 3,) shall be from June to October and the even semesters (2, 4,) shall be from October/November to March. Each semester shall have 90 working days inclusive of days of all examinations. The minimum duration for completion of a two year Postgraduate programme in any subject is four semesters and the maximum period for completion is eight semesters from the date of registration. No student shall register for more than 24 credits and less than 16 credits per semester subject to the provisions of the programmes concerned.

3.2 **Admission**: Eligibility for admissions and reservation of seats for various First semester (Postgraduate) programmes shall be according to the rules framed by the University from time to time. There shall be a uniform

Academic cum Examinations Calendar approved by the University for the registration, conduct and scheduling of examinations, and publication of results. The Academic cum Examinations Calendar shall be complied with by all colleges and offices, and the Vice Chancellor shall have all powers necessary for this purpose.

3.3 **Courses**: The Post graduate programme shall include three types of courses, viz., Core Courses, Elective Courses and Open Elective Courses (including MOOC courses). Parent Department shall offer appropriate elective courses for a specific programme. Open Elective Courses are offered either by the parent department or by any other Department or via MOOC. Open Elective courses can be opted in the third semester preferably having multidisciplinary nature. A course offered may have different components associated with the teaching-learning process of the course; namely 1. Lecture (L), 2. Tutorials (T) and 3. Practicals (P). 'L' stands for lecture session and every one-hour lecture session per week of a semester amounts to 1 credit. 'T' stands for tutorial session consisting of participatory discussion /self-study/desk work/brief seminar presentation by students. 'P' stands for practical session and it consists to acquire the much-required skill of applying the theoretically learnt concepts. A minimum of two-hour session of Tutorial or Practical amounts to 1 credit per semester. Maximum hours allotted for 1 credit practical course/tutorial course/seminar course shall not exceed 4 hours.

3.4. **Project/ Project and internship/Industry visit** There shall be a project work with dissertation (credit of which shall be decided by the concerned Board of Studies/Ad hoc committee) to be undertaken by all students. Project and dissertation work is a special course involving application of knowledge in solving/analysing/exploring a real-life situation/problem. The dissertation entails field work, lab work, report, presentation and viva

voce. Project with dissertation shall be done under the supervision of a faculty member of the department as per the curriculum design. A candidate may, however, in certain cases be permitted to work on the project in an industrial/ research organisation on the recommendation of the Head of the Department. In such cases, one of the teachers from the department concerned shall be the supervisor/internal guide and an expert from the industry/research organisation concerned shall act as co-supervisor/external guide. Project dissertation shall be submitted in the last week of February in the fourth semester. Belated and incomplete project reports will not be entertained. Dissertation on project shall be prepared as per the guidelines given as Annexure 1. Board of studies/Ad hoc committee of each programme shall frame guidelines for internship/industry /academy/ library visit or such items designed by the BOS/Ad hoc committee.

3.5 **Course code**: Every course offered is identified by a unique course code; where, first two letters to denote programme name (MA for Master of Arts, MS for Master of Science, MB for Master of Business Administration, MC for Master of Computer Application, CM for Master of Commerce, MW for Master of Social Work and MT for Master of Tourism and Travel Management). Next three letters denote subject. This is followed by semester number such as 01, 02, 03 and 04. After the semester numbers, single alphabet stands for Core (C) Elective (E) and Open Elective (O).The last two digits denote the serial number of the course in that category (C, E or O) in that programme.

Illustration.

MAENG01C02

MA = Master of Arts

ENG= English

01= First semester

C = Core

02= Serial number of the core course in the programme.

3.6 **Credits**: Each course shall have a specified number of credits. The total credits required for the successful completion of four-semester programme will be 80 but for MSW the total credits will be 100 and for MBA and MCA, 120 credits each. Minimum credits for core course shall be 64.The number of credits from Elective course/Open Elective course shall vary between 12 and 16. No course shall have more than 5 credits and for dissertation and General Viva Voce, the maximum credits shall be 10.

3.7 **Attendance**: A student shall be permitted to appear for the semester examination, only if the candidate secures not less than 75% attendance in all courses of a semester put together. Female students can avail 2% menstrual leave and require only 73 % of attendance. Maternity leave for 60 days shall also be granted to girls above 18 years as per U.O. No. Acad/C2/24654/2019 dated 25-03-2023.

Records of attendance shall be maintained by the concerned Department for a period of six years and the attendance register shall be made available for verification, as and when required by the University.

3.8 **Eligibility to register for examination**: Only those students who are registered for the University examination with eligible attendance (including those under condonable limit) alone are eligible to be promoted to next semester. Students who have attendance in the prescribed limit but could not register for examination are eligible to move to the next semester after availing token registration. The candidates shall apply for token registration within two weeks of the commencement of the next semester. Token registration is allowed only once during the entire programme. It shall be the duty of the principal to ensure that only eligible candidates are promoted to the next semester. The Vice Chancellor shall be competent to cancel the ineligible promotion and impose penalty on the Principal.

3.9 **Condonation**: Students are eligible for the condonation of shortage of attendance for a maximum of 14 days in a semester subject to a maximum two times during the whole period of Postgraduate Programme. Condonation of shortage of attendance may be granted by the Vice Chancellor on production of the medical certificate from a registered medical practitioner for the days absent. Students who attend, with prior concurrence from the Head of the department/ institution, the approved co-curricular activities of College/University/higher level /other agencies approved by the Principal are eligible to get their lost days treated as 'Present' on submission of an application to the Principal through the Head of the Department with a certificate of participation /

attendance certificate in such activities, provided the student concerned must receive the required course of instruction in lieu of the days/ hours lost as may be decided by the Head of the Department/ Principal.

A student who is not eligible for condonation of shortage of attendance shall repeat the semester along with the subsequent batch, in the same institution by availing re-admission.

3.10 For **re-admission** additional seats shall be allocated, if there is no vacancy in the batch concerned, with a maximum limit of 10% of the total seats, over and above the sanctioned strength.

3.11 **Absence from classes**: If a student registered in the first semester of a Postgraduate programme is continuously absent from the classes for more than 14 days at the beginning of the first semester without intimation to the Principal, the matter shall immediately be brought to the notice of the Registrar of the University, by the Principal. The names of such students shall be removed from the rolls. A student who is continuously absent for 14 days during a semester without sufficient reason and proper intimation to the Principal of the College shall be removed from the roll provided before removing the student from the roll, the Principal shall consult the College Council and shall communicate the student the decision of the College Council giving the student a reasonable time to file appeals/ complaints, if any, to the Principal before the date of strike off the roll. Such appeals/ complaints shall be considered by the College Council for further proceedings.

3.12 **Grace marks**: Grace marks shall be awarded to eligible candidates as per the University orders in this regard from time to time.

4. BOARD OF STUDIES AND COURSES

4.1 The programme/ course under these Regulations shall be designed to include the title of the programme /course, Programme Specific Outcome (PSO)/ Course Outcome (CO), the number of credits, maximum marks for End Semester Evaluation and Continuous Evaluation and the distribution there of, duration of examination hours and reference materials. Maximum efforts shall be made to maintain a uniform pattern while designing the courses, project, viva, practical etc. in the scheme and syllabus of various programmes coming under same faculty. The Vision and Mission Statements of the University and Programme Outcomes, as given in Annexure (i) and (ii) shall be given in all syllabi. The concerned PG Boards of Studies/ Ad hoc committees shall design all the courses offered in the Postgraduate programmes. The Boards/Ad hoc committees shall design and introduce new courses, modify or re-design existing courses and replace any existing courses with new/modified/re-designed courses to facilitate better exposures and training for the students.

4.2 Each course shall have an alpha-numeric code and title of the course. The code gives information on the subject, the semester number and the serial number of the course.

4.3 The syllabus of each course shall be prepared module (unit)-wise. Number of instructional hours and reference materials are also to be mentioned against each module.

4.4 The scheme of examination and model question papers are to be prepared by the Board of Studies/Ad hoc committee.

4.5 Board of Studies/Ad hoc committees should analyse the question papers of previous examinations.

4.6 Board of Studies/Ad hoc committee should make the changes in the syllabi and text books in consultation with the teachers concerned.

4.7 At least two meetings of teachers may be held in every department in every College, one in the mid-year and one towards the year end to discuss the academic and general activities of the Department. The recommendations of these meetings should be sent to the Boards of Studies/Ad hoc committee.

4.8 Boards of Studies/Ad hoc committees have to be constantly in touch with other Universities. Subject experts are to be identified in all major fields of study and endeavour, and consulted frequently.

4.9 Different types of questions shall possess different marks to quantify their required analysis. Maximum marks can vary from course to course depending on their comparative importance.

5. EXAMINATION

5.1 There shall be university examinations at the end of each semester. A candidate who fails to register for the University Examination shall not be permitted to move to the next semester. However, token registration is possible as per clause 3.8.

5.2 **Practical** examinations shall be conducted by the University at the end of the semester. If necessary, it shall be conducted before the End Semester Evaluation.

5.3 **External Viva-voce**, if any, shall be conducted along with the practical examination/project evaluation.

5.4 **Project/Dissertation** evaluation shall be conducted at the end of the fourth semester. 20 % of marks are to be awarded through continuous evaluation.

5.5 **Improvement:** Improvement of courses in a particular semester can be done only once. The student shall avail the improvement chance in the succeeding year along with the subsequent batch. If the candidate fails to appear for the improvement examination after registration, or if there is no change in the results of the improvement examination, the mark/grade obtained in the first appearance will be retained. Candidates may be permitted to cancel their improvement registration/appearance if applied before the publication of results, and after that application for cancellation shall not be permitted. To avoid a situation of undergoing two courses of study during the same academic year, those candidates who intend to avail improvement chance after successful completion of the programme, shall surrender their Grade Cards and submit their Transfer Certificate to the University along with application for registration for examination. Transfer Certificate shall be returned to the students after releasing the hall tickets and fresh Grade Card shall be issued incorporating the improvement results. There shall be no improvement chance for continuous evaluation, project/viva voce/practical. The internal marks already obtained will be carried forward to determine the new grade/mark in the improvement examination.

5.6 There shall be no supplementary examinations. For reappearance/improvement the students shall appear along with the students of subsequent admissions as and when the examinations are conducted by the University.

6. EVALUATION :

6.1 Course Evaluation:

The evaluation scheme for each course shall contain two parts

a) Continuous Evaluation (CE)
b) End Semester Evaluation (ESE)

20% Weightage shall be given to the Continuous Evaluation (CE) and 80% Weightage shall be for the End Semester Evaluation (ESE)

6.2 Continuous Evaluation (CE):

a. 20% of the total marks in each course are for continuous assessment. The continuous evaluation shall be based on a pre-determined transparent system involving two or more of the following components:

For theory course: written test, assignments, seminars, viva, book/article review etc.
For practical course: lab involvement, records, written test, etc.

b. Two components and their respective weightages shall be as prescribed in the scheme and syllabus by the Board of Studies/Adhoc committee concerned.
c. Attendance ***shall not be*** a component for Continuous Evaluation (CE).
d. There is no pass minimum insistence on Continuous Evaluation marks.

6.3 To ensure transparency in the evaluation process, the Continuous Evaluation marks awarded to the students in each component of each course in a semester shall be displayed on the notice board at least three days before the commencement of the End Semester Evaluation. There shall not be any chance for the improvement of Continuous Evaluation. Only the total CE marks awarded to a candidate in each course need be sent to university by the principal of colleges concerned. The College shall maintain the academic record of each student registered for the course, with the details of the marks awarded to each component of Continuous Evaluation of courses with the signatures of the students, course teacher and HoD which shall be preserved in the college for a period of six years from the last date of the End Semester Examination of

the semester concerned and shall be made available to the University for inspection as and when required. Complaints, if any, with regard to the Continuous Evaluation shall be submitted by the student to the Course Teacher. If the student feels that justice is denied, she/he can submit appeal to the Head of the Department and thereafter to the Principal of the College. The Department Council/ College Council shall consider the complaint and ensure that assessments are done by the teacher in a just and fair manner. In case the student is not satisfied with the decision at the college level, further appeal/complaints may be submitted by the student to the Controller of Examinations, Kannur University for being placed before the University Level Committee for consideration.

6.4 End Semester Evaluation (ESE)

End Semester Evaluation carries 80% of the total marks. The End Semester Evaluation in theory courses are to be conducted with the question papers set by external experts. The evaluation of the answer scripts shall be done by examiners appointed by the University based on a well-defined Scheme of valuation and answer keys provided by the University. After the End Semester Evaluation marks are to be entered in the answer scripts. Marks secured for End Semester Evaluation only need to be communicated to the University. All other calculations including grading are to be done by the University by the Chairperson of Board of Examiners. The End Semester Evaluation in the practical courses shall be conducted by two examiners (one internal and one external) appointed by the University. End Semester Evaluation of all

semesters will be conducted in centralised valuation camps immediately after the examination. All question papers shall be set by the University.

6.5 **Project Evaluation**: Project evaluation shall be conducted at the end of the fourth semester as per the following general guidelines or by the guidelines framed by the Board of Studies/Ad hoc committee concerned:

a. Evaluation of the Project Report shall be done under Mark System.

b. The evaluation of the project will be done at two stages:

i) Continuous Evaluation (supervising teachers will assess the project and award Continuous Evaluation Marks)

ii) End Semester Evaluation (external examiner appointed by the University)

c. Marks secured for the project will be awarded to candidates, combining the Continuous Evaluation and End Semester Evaluation marks.

d. The Continuous Evaluation to End Semester Evaluation components is to be taken in the ratio 1:4. Assessment of different components may be taken as follows:-

e. Components of Continuous Evaluation and End Semester Evaluation of Project other than the following can be decided by the concerned Board of Studies/Adhoc committee.

f. For internship/industry/academy/library visit, BOS/ Adhoc committee shall frame suitable evaluation methods including records presentation etc

Continuous Evaluation (20% of total)	
Components	**Percentage**

End Semester Evaluation (80% of total)	
Components	**Percentage**

Continuous Evaluation (20% of total)	
Punctuality	20
Use of Data	20
Scheme/Organization of Report	40
Viva voce	20

End Semester Evaluation (80% of total)	
Relevance of the Topic Statement of Objectives Methodology/Reference/Bibliography	5 10 15
Presentation of facts/figures/language style/diagrams etc Quality of Analysis/Use of Statistical tools	20 15
Findings and recommendations	10
Viva-Voce	25

g. External Examiners will be appointed by the University from the list of IV semester Board of Examiners in consultation with the Chairperson of the Board.

h. The chairman of the IV semester examination should form and coordinate the evaluation teams and their work.

i. Continuous Evaluation should be completed 2 weeks before the last working day of the IV semester.

j. Continuous Evaluation marks should be published in the department.

k. In the case of courses with practical examination, project evaluation shall be done along with practical examinations.

l. Chairperson Board of Examinations, may at his/her discretion, on urgent requirements, make certain exception in the guidelines for the smooth conduct of the evaluation of project.

m. Submission of the Project Report and presence of the student for Viva are compulsory for Continuous Evaluation. No marks shall be awarded to a candidate if she/he fails to submit the Project Report for End Semester Evaluation.

n. The student should get a minimum of 40 % marks of the aggregate and 40% separately for ESE and 10% CE for a pass in the project.

o. There shall be no improvement chance for the Marks obtained in the Project Report.

p. In an instance of inability of obtaining a minimum pass marks as required under clause 6.5 n, the project work shall be re- done and the report may be re-submitted along with subsequent exams through parent department.

6.6 **Viva Voce**: There shall be a comprehensive viva voce at the end of the programmes covering questions from all courses of the programme including project work. The candidate shall present one copy of the Dissertation on project before the Viva voce board. The viva voce shall be conducted by two external examiners.

7. GRADING:

7.1 Indirect Grading System based on the scale specified in clause 7.2 is used to evaluate the performance of students.

7.2 Indirect grading system shall be adopted for the assessment of a student's performance in a course (both CE and ESE) Each course is evaluated by assigning marks with a letter grade (A^+, A, B, C, D, E and F) to that course by the method of indirect grading. Mark system is followed instead of direct grading for each question. For each course in the semester, letter grade, grade point and percentage of marks are introduced in the indirect grading system with scale as per guidelines given below:

% of Marks (CE+ESE)	Grade	Interpretation	Range of Grade Points
90 and above	A+	Outstanding	9-10
80 to below 90	A	Excellent	8-8.99
70 to below 80	B	Very Good	7-7.99
60 to below 70	C	Good	6-6.99
50 to below 60	D	Satisfactory	5-5.99
40 to below 50	E	Pass	4-4.99

% of Marks (CE+ESE)	Grade	Interpretation	Range of Grade Points
Below 40	**F**	**Failure**	**0-3.99**

7.3 Evaluation (both CE and ESE) is carried out using Mark system. The grading on the basis of a total CE and ESE marks will be indicated for each course. Each letter grade is assigned a '**Grade point**' (GP) which is a point given to a grade on the scale as envisaged under clause 7.2 and is obtained using the formula:

Grade Point = (Total marks awarded / Total Maximum marks) x 10.

7.4 '**Credit point**' (CP) of a course is the value obtained by multiplying the grade point (GP) by the credit (C) of the course

CP = GP x C

A minimum of grade point 4 is needed for the successful completion of a course.

7.5 A candidate securing not less than 40% of aggregate marks of a course [both ESE and CE put together) with not less than 40% in End Semester Examination [ESE] shall be declared to have passed in that course. A minimum of grade point 4 with letter grade E is needed for the successful completion of a course.

7.6 Appearance for Continuous Evaluation (CE) and End Semester Evaluation (ESE) are compulsory and no grade shall be awarded to a candidate if she/he is absent for CE/ESE or both.

7.7 After the successful completion of a semester, Semester Grade Point Average (SGPA) of a student in that semester is calculated using the formula given below.

SGPA = Sum of the Credit Points of all courses in a semester / Total Credits in that semester

Semester Grade Point Average' (SGPA) is the value obtained by dividing the sum of credit points obtained by a student in the various

courses taken in a semester by the total number of credits in that semester. SGPA determines the overall performance of a student at the end of a semester.

For the successful completion of a semester, a student should pass all the courses in that semester. However, a student is permitted to move to the next semester irrespective of the SGPA obtained.

SGPA shall be rounded off to three decimal places.

7.8 The **Cumulative Grade Point Average** (CGPA) of the student is calculated at the end of each semester. The CGPA of a student determines the overall academic level of the student in each stage of the programme. CGPA can be calculated by the following formula:

CGPA = Sum of Credit Points of all completed semesters / Total Credits acquired

CGPA shall be rounded off to three decimal places.

7.9 At the end of the programme, the overall performance of a candidate is indicated by the Overall Grade Point Average. **Overall Grade Point Average (OGPA)** of the student is calculated at the end of the programme. The OGPA of a student determines the overall academic level the student in a programme and is the criterion for classification and ranking the students. OGPA can be calculated by the following formula.

OGPA = Sum of Credit Points obtained in all semesters of the programme / Total Credits (80)

OGPA shall be rounded off to three decimal places.

An overall letter grade for OGPA for the entire programme shall be awarded to a student after completing the entire programme successfully. Overall letter grade based on OGPA and conversion of Grades into classification shall be in the following way.

Grade range OGPA	Overall Letter Grade	Classification
9 - 10	A+	First class with Distinction
8 - 8.999	A	
7 - 7.999	B	First class

Grade range OGPA	Overall Letter Grade	Classification
6 - 6.999	C	
5 - 5.999	D	Second class
4 - 4.999	E	Pass
Below 4	F	Fail

7.10 The Percentage of marks based on OGPA is calculated by multiplying them by 10.

Percentage in two decimal places = [OGPA in three decimal places] x

10

7.11 Those candidates who pass all the courses prescribed for a programme shall be declared to have successfully completed the programme and eligible for the degree. Minimum OGPA required for the successful completion of the degree programme is 4. In the event a candidate fails to secure pass in any course in a semester, consolidation of SGPA and CGPA will be made only after obtaining pass in the failed course in the subsequent appearance, as envisaged in clause 7.5.

7.12 A student who fails to secure a minimum mark for a pass in a course is permitted to write the examination along with the subsequent batch.

7.13 **Moderation:** Moderation shall be decided by the concerned Board of examiners subject to the Statistics of marks made available from the Examination branch and as per the prescribed guidelines.

7.14 **Revaluation:** In the new system revaluation is permissible. The prevailing rules and regulations of revaluation are applicable to KUCBCSSPG2023.

8. GRADE CARD

8.1 The University shall issue to the students grade/marks card (by online) on completion of each semester, which shall contain the following information:

a) Name of University

b) Name of College
c) Month and year of examination
d) Title of Postgraduate Programme
e) Semester concerned
f) Name and Register Number of student.
g) Course Code, Title and Credits of each course opted in the semester
h) Continuous Evaluation marks, End Semester Evaluation marks, total marks, Grade point (G), Credit point and Letter grade in each course in the semester
i) Total credits, total credit points and SGPA in the semester (corrected to three decimal places)
j) Semester percentage = SGPA X 10 and CGPA separately.

8.2 The **final Grade/mark Card** issued at the end of the final semester shall contain the details of all courses taken during the entire programme including those taken over and above the prescribed minimum credits for obtaining the degree. The final grade card shall show OGPA (corrected to three decimal places) and the overall letter grade of a student for the entire programme. If the students are in need of separate grade card of each semester for the purpose of higher studies, the same shall be issued on attestation by the Controller of Examinations / Joint Registrar/ Deputy Registrar/ Assistant Registrar after levying the prescribed fee.

9. AWARD OF DEGREE

9.1 For the successful completion of all the courses (core, elective and open elective (multidisciplinary)) a candidate has to secure minimum E grade as provided in clause 7. Satisfying the minimum credit 80 and securing minimum OGPA 4 shall be the minimum requirement for the award of degree.

9.2 Rank certificates up to third rank shall be issued, instead of Position

Certificates, on the basis of highest OGPA secured for the programme.

10. MONITORING OF THE PROGRAMME AND GRIEVANCE REDRESSAL MECHANISM

10.1 **College level**: Every programme conducted under the Choice Based Credit and Semester System in a College shall be monitored by the College Council. The College shall form a Grievance Redressal Committee in each department comprising of course teacher and one senior teacher as members and the Head of the department as chairperson. This committee shall address all grievances relating to the continuous evaluation marks of the students. There shall be a college level Grievance Redressal Committee comprising of staff advisor of College Union as Convenor, Chairperson of College Union, General Secretary of College Union, two senior teachers and two members elected by the College Council from among the teachers of the College as members and Principal as Chairperson.

10.2 **University level**: The University shall form a Grievance Redressal Committee under the chairmanship of Pro-Vice Chancellor as the Chairperson with Convenors of Standing Committees on Examinations, and Student Welfare, Controller of Examinations as Convenor, One Senior officer in Examination branch not below the rank of Joint

Registrar/Deputy Registrar , Director of Student Services ,University Union Chairperson, University Union General Secretary as members to consider the complaints/appeal from students with regard to Continuous Evaluation or any other matter coming under the purview of these regulations .

11. TRANSITORY PROVISION

Notwithstanding anything contained in these regulations, the Vice-Chancellor shall, for a period of three year from the date of coming into force of these regulations, have the power to make provisions by order to address any issues arising out of the implementation of these regulations for solution of which no provisions are explicitly provided in these regulations. All such decisions taken by the Vice Chancellor shall be reported to the Academic Council and the Syndicate.

12. REPEAL

The Regulations now in force in so far as they are applicable to Post Graduate programmes offered by the University and to the extent they are inconsistent with these regulations stand repealed. In the case of any inconsistency between any other existing regulations and these regulations in their application to any programme offered in a College, the latter shall prevail.

Annexure 1; Guidelines for the preparation of dissertation on project:

1.Arrangement of contents shall be as follows:

1. Cover page and title page
2. Bonafide certificate
3. Declaration by the student
4. Acknowledgements
5. Table of contents
6. List of tables
7. List of figures
8. List of symbols, Abbreviations and Nomenclature
9. Chapters
10. Appendices
11. References

2. Page dimension and typing instruction:

The dimension of the dissertation on project should be in A4 size. The dissertation should be typed in bond paper and bound using flexible cover of the thick white art paper or spiral binding. The general text shall be typed in the font style 'Times New Roman' and font size 12. For

major headings font size may be 16 and minor heading 14. Paragraph should be arranged in justified with margin 1.25 each on top. Portrait orientation shall be there on left and right of the page. The content of the report shall be around 40 pages.

3. Bonafide certificate shall be in the following format

CERTIFICATE

This is to certify that the project entitled .....(title) submitted to the Kannur University in partial fulfilment of the requirements of Post Graduate Degree in .....(subject), is a Bonafide record of studies and work carried out by .....(Name of the student) under my supervision and guidance.

Office seal

Signature, name, designation and official address of the Supervisor.

Date

4. Declaration by the student shall be in the following format:

DECLARATION

I.....(Name of the candidate) hereby declare that this project titled .....(title) is a bonafide record of studies and work carried out by me under the supervision of .....(Name, designation and official address of the supervisor), and that no part of this project, except the materials gathered from scholarly writings, has been presented earlier for the award of any degree or diploma or other similar title or recognition.

Date: Signature and name of the student

KANNUR UNIVERSITY

SCHEME AND SYLLABUS

FOR

POSTGRADUATE PROGRAMME

(M.Sc. DEGREE COURSE)

IN

FORESTRY (WILDLIFE MANAGEMENT)

UNDER

CHOICE BASED CREDIT AND SEMESTER SYSTEM
(OBE – Outcome Based Education – system)

With effect from 2023 admission

KANNUR UNIVERSITY
M.Sc. FORESTRY (WILDLIFE MANAGEMENT)
Curriculum for Choice Based Credit and Semester System for Postgraduate Programme in Affiliated Colleges -2023
(OBE – Outcome Based Education – system)

Kannur University introduced Outcome Based Education (OBE) in the curriculum for undergraduate students in 2019. Expanding OBE to the Postgraduate curriculum and syllabus from the academic year 2023 onwards demonstrates the university's commitment to further improving the learning experience for its students across different academic levels. This move is to enhance the academic rigour and relevance of the Postgraduate programmes, better preparing the students for their future careers and challenges. Outcome based education is an educational methodology where each aspect of education is organized around a set of goals (outcomes). Students should achieve their goal by the end of the educational process. Throughout the educational experience, all students should be able to achieve their goals. It focuses on measuring student performance through outcomes. The OBE model aims to maximize student learning outcomes by developing their knowledge & skills. The key to success in outcome-based education is clarity, for both teachers and students to understand what's expected of them. Outcome-based education aims to create a clear expectation of results that students must achieve. Here, the outcome includes skills, knowledge and attitude. In addition to understanding what's expected, outcome-based education also encourages transparency. The basic principle of outcome-based education is that students must meet a specific standard to graduate. Hence, no curve grading is used in outcome-based education, and instead, teachers are free to experiment with any methodology they feel is best.

Mission statements

- To produce and disseminate new knowledge and to find novel avenues for application of such knowledge.
- To adopt critical pedagogic practices which uphold scientific temper, the uncompromised spirit of enquiry and the right to dissent.
- To uphold democratic, multicultural, secular, environmental and gender sensitive values as the foundational principles of higher education and to cater to the modern notions of equity, social justice and merit in all educational endeavours.

- To affiliate colleges and other institutions of higher learning and to monitor academic, ethical, administrative and infrastructural standards in such institutions.
- To build stronger community networks based on the values and principles of higher education and to ensure the region's intellectual integration with national vision and international standards.
- To associate with the local self-governing bodies and other statutory as well as non-governmental organizations for continuing education and also for building public awareness on important social, cultural and other policy issues.

Programme Outcomes (POs):

Programme outcomes can be defined as the objectives achieved at the end of any specialization or discipline. These attributes are mapped while a student is doing graduation and determined when they get a degree.

PO 1. Advanced Knowledge and Skills: Postgraduate courses aim to provide students with in-depth knowledge and advanced skills related to their chosen field. The best outcome would be to acquire a comprehensive understanding of the subject matter and develop specialized expertise.

PO 2. Research and Analytical Abilities: Postgraduate programmes often emphasize research and analytical thinking. The ability to conduct independent research, analyze complex problems, and propose innovative solutions is highly valued.

PO 3. Critical Thinking and Problem-Solving Skills: Developing critical thinking skills is crucial for postgraduate students. Being able to evaluate information critically, identify patterns, and solve problems creatively are important outcomes of these programs.

PO 4. Effective Communication Skills: Strong communication skills, both written and verbal, are essential in various professional settings. Postgraduate programs should focus on enhancing communication abilities to effectively convey ideas, present research findings, and engage in academic discussions.

PO 5. Ethical and Professional Standards: Graduates should uphold ethical and professional standards relevant to their field. Understanding and adhering to professional ethics and practices are important outcomes of postgraduate education.

PO 6. Career Readiness: Postgraduate programs should equip students with the necessary skills and knowledge to succeed in their chosen careers. This includes practical skills, industry-specific knowledge, and an understanding of the job market and its requirements.

PO 7. Networking and Collaboration: Building a professional network and collaborating with peers and experts in the field are valuable outcomes. These connections can lead to opportunities for research collaborations, internships, and employment prospects.

PO 8. Lifelong Learning: Postgraduate education should instill a passion for lifelong learning. The ability to adapt to new developments in the field, pursue further education, and stay updated with emerging trends is a desirable outcome.

Program-Specific Outcomes (PSOs) of M. Sc. Forestry (Wildlife Management) program.

After the successful completion of M. Sc. Forestry (Wildlife Management) program, the students shall be able to:

PSO1: Develop a strong foundation in forestry concepts, including forest ecosystems, biodiversity, habitat assessment, and sustainable management practices, contributing to holistic natural resource management strategies.

PSO2: Acquire a deep understanding of wildlife ecology, behavior, and conservation principles, enabling them to effectively manage and conserve diverse wildlife populations and their habitats.

PSO3: Master modern techniques for forest and wildlife monitoring, population assessment, habitat restoration, and mitigation of human-wildlife conflicts, enhancing their ability to address real-world challenges.

PSO4: Understand the fundamental aspects of biostatistics, bioinformatics tools, and biophysical principles, which will aid in the analysis of relevant biological situations and the development of intellectual skills on biological data and database analysis.

PSO5: Allows learners to develop a deep connection with nature and refine their observation skills, ultimately leading to more accurate and confident identifications of wild flora and fauna.

Eligibility for Admission

The eligibility criteria for admission to the M.Sc. Forestry programme shall be as follows;

Qualification: A bachelor's degree in Life Science related subjects (Core) such as Forestry, Botany, Plant Science, Zoology, Biotechnology, Microbiology, Biochemistry, Environmental Science, Veterinary Science, Agriculture allied subjects, or any other degrees recognized as equivalent thereof, from a recognized university with not less than 50% marks or equivalent grade.

A weightage of 25% of the index marks shall be given to the B.Sc Forestry holders while preparing the rank list of the applicants.

Age and other criteria: As per the Kannur University PG Regulations on Admission.

Duration of the Programme:

The duration of the M.Sc. Forestry (Wildlife Management) shall be of 2 years consisting of 4 Semesters. Each Semester consists of a minimum of 450 contact hours distributed over 90 working days.

Structure of the Programme:

The total credits required for successful completion of the programme is 80. Core courses have a total credit of 68 and elective courses carry 12 credits.

Core Courses: Core courses are compulsory courses designed to meet the core requirement of providing a basic and advanced understanding of the discipline.

Open Elective Courses: Open elective courses (4 credits) are offered in the third semester of the program. An open elective course is chosen generally from an unrelated discipline to enhance the general exposure outside the main discipline. The students pursuing M. Sc. Forestry (Wildlife Management) have to opt for Open Elective courses offered by other Departments based on their interests. The scope of the Open Elective Courses is to effectively enhance horizontal mobility across diverse disciplines.

Discipline-Specific Elective Courses: Discipline-Specific Elective courses are offered by the Department to enhance the flexibility of selection of an area of specialization from a pool of courses. These courses are considered specialized or advanced with respect to M. Sc. Forestry (Wildlife Management) program and provide extensive exposure in the area chosen. A total of 6 Elective courses are offered by the Department of which a student has to complete two courses from the chosen area in the fourth semester of the program.

Project Work / Master's Dissertation

There shall be a project work with dissertation (6 credits) to be undertaken by all students. Project dissertation work is a major component involving application of knowledge in solving/analysing/exploring a real-life situation/problem. The dissertation entails fieldwork, lab work, report, presentation and viva voce. Project dissertation shall be done under the supervision of a faculty member of the department as per the curriculum. A candidate may, however, in certain cases be permitted to work on the project in an industrial/research organisation on the recommendation of the Head of the Department and with permission of the Head of the Institution. In such cases, one of the teachers from the department concerned shall be the supervisor/internal guide and an expert from the industry/research organisation concerned shall act as co-supervisor/external guide. Project Dissertation shall be submitted two weeks before the commencement of ESE of fourth semester. Belated and incomplete projects will not be entertained. Dissertation on project shall be prepared as per the guidelines given in the Kannur University PG regulation 2023.

Forestry EduTour

Each student shall undergo practical training and field works at the areas/institutes given in the course outline, and make detailed reports. Each student shall maintain a field diary to record the observations. The student should submit the field diary for internal evaluation. Each student shall submit a report based on his/her field diary and the report shall be evaluated by the external examiner at the end of the fourth semester.

EVALUATION:

Course Evaluation:

The evaluation scheme for each course shall contain two parts

a) Continuous Evaluation (CE)
b) End Semester Evaluation (ESE)

20% weightage shall be given to the Continuous Evaluation (CE) and 80% weightage shall be for the End Semester Evaluation (ESE)

Continuous Evaluation (CE):

The allocation of marks for each component under Continuous Evaluation shall be in the following proportions. There is no pass minimum insistence on Continuous Evaluation marks.

Theory	Practical

Components	Weightage	Marks	Components	Weightage	Marks
Test Paper	60%	9	Practical Test	40%	6
Assignments/ seminars/ viva/	20%	3	Record	40%	6
Book / article review	20%	3	Submissions	20%	3
Total	100%	15 Marks	Total	100%	15 Marks

To ensure transparency of the evaluation process, the continuous evaluation marks awarded to the students in each component of each course in a semester shall be notified on the notice board at least three days before the commencement of End Semester Evaluation. There shall not be any chance for improvement in Continuous Evaluation. Only the total CE marks awarded to a candidate in each course need to be sent to the university by the Principal of the colleges concerned. The College shall maintain the academic record of each student registered for the course, with the details of the marks awarded to each component of Continuous Evaluation of courses with the signatures of the students, course teacher and HoD which shall be preserved in the college for a period of six years from the last date of the End Semester Examination of the semester concerned and shall be made available to the University for inspection as and when required. Complaints if any with regard to the Continuous Evaluation shall be submitted by the student to the Course Teacher first. If the student feels that justice is denied, she/he can submit appeal to the Head of the Department and thereafter to the Principal of the College. The Department Council/ College Council shall consider the complaint and ensure that assessments are done by the teacher in a just and fair manner. In case the student is not satisfied with the decision at the college level, further appeal/complaints may be submitted by the student to the Controller of Examinations, Kannur University for being placed before the University Level Committee for consideration.

End Semester Evaluation (ESE)

End Semester Evaluation carries 80% of total marks. The End Semester Evaluation in theory courses is to be conducted with question papers set by external experts. The evaluation of the answer scripts shall be done by examiners appointed by the University based on a well-defined Scheme of valuation and answer keys provided by the University. After the End Semester Evaluation, only marks are to be entered in the answer scripts. Marks secured for End

Semester Evaluation only need to be communicated to university. All other calculations including grading are done by the university by the Chairperson of the Board of Examiners. The End Semester Evaluation in practical courses shall be conducted by two examiners (one internal and one external) appointed by the University. End Semester Evaluation of all semesters will be conducted in centralized valuation camps immediately after the examination. All question papers shall be set by the university.

Project Evaluation: Project evaluation shall be conducted at the end of the fourth semester as per the following general guidelines or by the guidelines framed by the Board of Studies concerned:

Evaluation of the Project Report shall be done under Mark System.

The evaluation of the project will be done in two stages:

a) Continuous Evaluation (Supervising Teachers will assess the project and award internal Marks)

b) End Semester Evaluation (External Examiner appointed by the University)

Marks secured for the project will be awarded to candidates, combining the Continuous Evaluation and End Semester Evaluation marks.

The Continuous Evaluation to End Semester Evaluation components is to be taken in the ratio 1:4.

a. The allocation of marks for each component under Continuous Evaluation shall be in the following proportions

Continuous Evaluation (20 Marks)	
Components	**Percentage**
Punctuality	20
Use of Data	20
Scheme/Organization of Report	40
Viva voce	20

b. The allocation of marks for each component under End Semester Evaluation shall be in the following proportions

End Semester Evaluation (80 Marks)	
Components	**Percentage**
Relevance of the Topic	10
Presentation of facts/ figures/ language style/ diagrams etc	40
Findings and recommendations	20

Viva-Voce	30

c. **Viva Voce:** There shall be a comprehensive viva voce at the end of the programme covering questions from all courses of the programme including project work. The candidate shall present one copy of the Dissertation on the project before the Viva-voce board. The viva voce shall be conducted by two external examiners.

Pass Conditions:

a. Appearance for Continuous Evaluation (CE) and End Semester Evaluation (ESE) are compulsory and no grade shall be awarded to a candidate if she/he is absent for CE/ESE or both.

b. A minimum of grade point 4 is needed for the successful completion of a project work. The student should get a minimum of 40 % marks of the aggregate and 40% separately for ESE and 10% CE for a pass in the project.

Evaluation of Forestry EduTour

Evaluation of Forestry EduTour shall be done under Mark System in two stages. Internal Assessment by the supervising teacher and External Evaluation by the examiner appointed by the University. The internal to external components is to be taken in the ratio 1:4. Assessment of different components may be taken as below.

Internal Assessment (10 Marks)		
Components	Percentage of marks	Marks
Field Involvement	50	5
Field Diary	50	5
Total	100	10
External Assessment (40 Marks)		
Components	Percentage of marks	Marks
Report	75	30
Viva-Voce	25	10
Total	100	40

Pass Conditions:

a. Participation in forestry educational tours is indispensable

b. Submission of the Field Diary, Report and presence of the student for viva-voce are compulsory for the evaluation. No marks shall be awarded to a candidate if she/he fails to submit the Report for external evaluation.

c. The student should get a minimum of 40% marks for pass in Forestry EduTour, and there shall be no improvement chance for the Marks obtained. In an instance of the inability of obtaining a minimum of 40% marks, the field works must be re-done and the report should be re-submitted along with subsequent exams through parent department.

Sem.	Sem.	Course	Course Code	Course Title	CIA	ESE	Hrs/week T	Hrs/week P	Credit
	III	Open Elective	MSFOR03O01	Ecotourism and Wildlife Photography	15	60	75	3	4
I	MSFOR01C01			Forests and Biogeography	15	60	75	3	2	4
	MSFOR01C02			Dendrology and Vegetation Analysis	15	60	75	4	3	4
	MSFOR01C03			Forest Ecology	15	60	75	4	3	4
	MSFOR01C04			Fundamentals of Wildlife Science	15	60	75	4	2	4
	MSFOR01C05			Practical I	15	60	75	-	-	4
	TOTAL				**75**	**300**	**375**	**15**	**10**	**20**
II	MSFOR02C06			Nursery Techniques and Plantation Forestry	15	60	75	4	2	4
	MSFOR02C07			Forest Biometry	15	60	75	4	3	4
	MSFOR02C08			Conservation Biology and Captive Wildlife Management	15	60	75	3	2	4
	MSFOR02C09			Research Methodology and Biostatistics	15	60	75	4	3	4
	MSFOR02C10			Practical II	15	60	75	-	-	4
	TOTAL				**75**	**300**	**375**	**15**	**10**	**20**
III	MSFOR03C11			Wildlife Management and Monitoring Techniques	15	60	75	3	2	4
	MSFOR03C12			Forest Health and Protection	15	60	75	3	2	4
	MSFOR03C13			Forest Resource Management and Utilization	15	60	75	3	2	4
	MSFOR03C14			Global Change Ecology and Ecosystem Resilience	15	60	75	3	2	4
	MSFOR03O 01/02/03			Open Elective (Multi-Disciplinary)	15	60	75	3	2	4
	TOTAL				**75**	**300**	**375**	**15**	**10**	**20**
IV	MSFOR04E 01/02/03			Elective I	15	60	75	3	2	4
	MSFOR04E 04/05/06			Elective II	15	60	75	3	2	4
	MSFOR04C15			Forestry EduTour	10	40	50	-	-	2
	MSFOR04C16			Practical III	15	60	75	-	-	4
	MSFOR04C17			Project Dissertation & Viva Voce	20	80	100	-	15	6
	TOTAL				**75**	**300**	**375**	**6**	**19**	**20**
GRAND TOTAL							**1500**			**80**

Elective Courses

IV	Elective I	MSFOR03O02	Conservation Laws and EIA	3	2	4
		MSFOR03O03	Ethnobiology	3	2	4
		MSFOR04E01	Wildlife Forensics	3	2	4
		MSFOR04E02	Ecological Informatics	3	2	4
		MSFOR04E03	Invertebrate ecology	3	2	4
	Elective II	MSFOR04E04	Wetland Ecology	3	2	4
		MSFOR04E05	Restoration Ecology	3	2	4
		MSFOR04E06	Behavioral Ecology	3	2	4

KANNUR UNIVERSITY

SCHEME AND SYLLABUS

FOR

CORE COURSES

OF

M.Sc. FORESTRY (WILDLIFE MANAGEMENT)

UNDER

CHOICE BASED CREDIT AND SEMESTER SYSTEM
(OBE – Outcome Based Education – system)

With effect from 2023 admission

MSFOR01C01 – FORESTS AND BIOGEOGRAPHY

Hours per week: 3+2 **Credit: 4**

Course Outcomes:

- Basic knowledge on the forest biomes of the world and forest types in India

- Basic understanding of the biomes of the world, zoogeographic regions of the world and biogeographic zones of India
- Classify forests based on their composition
- Understand the threats and conservation challenges in Indian forests

Module I: ***Introduction to Forests and Forestry:*** Definitions of a forest. Evergreen and deciduous trees. Classification of forests. Important role of forests. Definition and branches of Forestry. History and evolution of scientific forest management in India. Pre-independence and post-independence scenarios of Indian forestry.

Module II: ***Forests and Biogeography of the World:*** Theory of Continental Drift. Zoogeographic regions of the world. Terrestrial and water biomes of the world. Distribution, characteristic features, and life forms of the forest biomes of the world: temperate coniferous forests, subtropical deciduous forests and tropical evergreen forests.

Module III: ***Forests and biogeography of India:***Biogeographic zones of India**.** Natural history and significance of Western Ghats. Satpura hypothesis, the affinity of Western Ghats with North East. Champion and Seth classification of forest types in India. Distribution and Characteristic features of wet evergreen forests, semi-evergreen forests, moist deciduous forests, littoral and swamp forests and dry deciduous forests in India.

Module IV: ***State of the Forests:*** Important role of forests – productive, protective, regulatory and recreational roles. Threats and conservation challenges to forests in India. Critical analysis on The State of the World's Forests by FAO, State of the Forest reports by FSI.

Practicals: -

1. Visit a forest area and identify the forest type(s)
2. Visit evergreen and deciduous forest types and study the species composition
3. Visit a mangrove forest and study the zonation of mangrove flora
4. Map the biogeographic zones of India
5. Map the zoogeographic regions of the world

References: -

1. *Agarwal, W.P. Forests in India. Oxford and I.B.H*
2. *Khanna, L.S.1989. Principles and Practice of Silviculture. KhannaBandhu, Dehra Dun. 473 p*
3. *Kishwan, J., Pandey, D., Goyal A. K. and Guptha A. K. 2007. India's Forests. MoEF. New Delhi*
4. *Mather, A.S. 1990. Global forest resources. Belhaven, London*
5. *P.R. Sinha, V.B. Mathur and B. C. Sinha. 2009. India's Green Book. Wildlife Institute of India*
6. *Paul, L. Tropical forestry Hand Book. Springer Verlag Publications New York (2Vol)*

7. *Persson, R. 1992. World forest resources. Periodical experts, New Delhi.*
8. *Raj, A. J. and Lal S. B. 2013. Forestry – Principles and Applications. Scientific Publishers, New Delhi*
9. *S. A. Sha. Forestry for people. ICAR, New Delhi*
10. *Sahoo A. K. 2011. The Text Book of Forest Ecology, Biodiversity and Conservation. Indian Books and Periodicals. New Delhi.*
11. *Singh, V. Forest environment and biodiversity. Daya Publishing House, Delhi*
12. *State of the Forest Reports. Forest Survey of India, MoEF, Govt. of India*
13. *Tewari, D.N. Biodiversity and forest genetic resources. Published by International Book Distributions, Dehra Dun.*

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MSFOR01C02 DENDROLOGY AND VEGETATION ANALYSIS

Hours per week: 4+3 **Credit: 4**

Course Outcomes:

- Identify trees using spot characters
- Understand sampling and analysis methods used in vegetation science
- Measure or estimate vegetation attributes using different field techniques
- To understand vegetation structure, composition and function

Module I. ***Plant Taxonomy:***Classification of flowering plants- Principles, Outlines, Merits and Demerits of Bentham and Hooker system of plant classification. Classification based on molecular systematics - APG I to APG IV. Merits and demerits of phylogenetic classification. Molecular data for phylogenetic analysis and identification- Acquisition and analysis of DNA sequence data- Polymerase Chain Reaction; DNA barcoding.

Module II. ***Taxonomy of forest trees:*** Systematic position, diagnostic features, floral formula, economic importance and important members of the following families- Annonaceae, Clusiaceae, Dipterocarpaceae, Sterculiaceae, Tiliaceae, Rutaceae, Meliaceae, Sapindaceae, Anacardiaceae, Leguminosae (Subfamilies: Fabaceae, Caesalpiniaceae, Mimosaceae), Rhizophoraceae, Combretaceae, Myrtaceae, Rubiaceae, Verbenaceae, Sapotaceae, Apocynaceae, Bignoniaceae, Lamiaceae, Lauraceae, Santalaceae, Euphorbiaceae and Casuarinaceae

Module III: ***Qualitative analyses of communities:*** Structural analysis of communities – species area curve method – transect and quadrate - density- abundance - frequency- dominance and IVI. Remote sensing as a tool for vegetation analysis, NDVI, land use – land cover mapping.

Module IV: ***Forest Biomass estimation:*** Forest biomass and its measurement- Above ground biomass, below ground biomass, carbon content of biomass, forest carbon sequestration, emission trading, Classification of increment, CAI and MAI, increment percentage, yield table, Enumeration of growing stock- definition, objects, kinds of enumeration.

Practicals: -

1. Workout of plant specimens and description of vegetative and reproductive characters of families mentioned in the syllabus.
2. Training in the identification of pants using relevant literatures, herbaria and digital tools
3. Study of various taxa of a genus, determining key characters and preparation of keys at species level.
4. Field visit for familiarization with and study of vegetation type(s) and flora(s) and training in collection and preservation methodologies.
5. Vegetation sampling - Transect method -quadrate method
6. Determine the minimum size of the quadrat by species area-curve method.
7. Estimation of IVI using quadrate / plot method
8. Development of allometric equation for the biomass of important species
9. Assessment of carbon-stock.
10. Calculation of CAI, MAI and Increment Percent

Submission: Herbarium collection of any 20 trees belonging to the families mentioned in the syllabus

References: -

1. *Datta, S. C. 1988. Systematic Botany. Wiley Eastern Limited, New Delhi.*
2. *Davis, P. H. and Heywood, V. H. 1963. Principles of Angiosperm Taxonomy. Princeton, NJ: Van Nostrand.*
3. *Jain S. K. and R. R. Rao. 1977. Handbook of Field and Herbarium Methods. Today and Tomorrow's Printers and Publishers. New Delhi*
4. *Johnes, S. B. and Luchsinger, A. E. 1987. Plant Systematics. McGraw-Hill. London.*
5. *Johri, R. M and SnehLata. 2005. Taxonomy- 1 (Systematics and Morphology). Sonali Publications*
6. *Johri, R. M and SnehLata. 2005. Taxonomy- 2 (Polypetalae). Sonali Publications*
7. *Johri, R. M and SnehLata. 2005. Taxonomy- 3 (Gamopetalae). Sonali Publications*
8. *Judd, W. S., Campbell, C. S., Kellogg, E. A., Stevens, P. F., Donoghue, M. J. 2008. Plant Systematics – A Phylogenetic Approach. Sinauer Associates, Inc., Sunderland, Massachusetts USA.*
9. *Kent, M. and Coker, P., 1992: Vegetation Description and Analysis: A Practical Approach. New York: John Wiley and Sons.*
10. *Lawrence, G.H.M. 1967. Taxonomy of Vascular Plants. Oxford & IBH, New Delhi.*
11. *McCune, B. and Grace, J., 2002: Analysis of ecological communities. Gleneden Beach, Oregon: MjM Software Design*
12. *Michael, P. 1984. Ecological Methods for Field and Laboratory Investigations. Tata McGrawHill Pub. Co. New Delhi, 404p*
13. *Mishra. S. R. 2010. Textbook of Dendrology. Discovery Publishing House Pvt. Ltd. New Delhi.*
14. *Mueller-Dombois, L. D. and Ellenberg, H., 1974: Aims and Methods of Vegetation Ecology. Boca Raton: CRC Press.*
15. *Naqshi, R. 1993. An Introduction to Botanical Nomenclature. Scientific Publishers. Jodhpur.*
16. *Pandey S. N. and S. P. Mishra. 2008. Taxonomy of Angiosperms. Ane Books India, New Delhi.*

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MSFOR01C03 - FOREST ECOLOGY

Hours per week: 4+3 **Credit: 4**

Course Outcomes:

- Understand the concepts in population and community ecology
- Explain the theories and models in succession
- Understand the ecological functions of different forest layers and their roles in nutrient cycling, energy flow, and habitat provision
- Identify the major forest types of Kerala

Module I: ***Population Ecology:*** Population dynamics- population size, population density, population distributions, population structure, population interactions, population growth model- exponential and logistic growth, r/k strategies, survivorship curves, population factors- top-down control, and bottom-up control, Trophic cascades.

Module II: ***Ecological Succession:*** Succession: definition and Classification- based on stages of development, ecosystem factors, nature of deposits, based on substrate. Process of succession- nudation, invasion, competition & coaction, reaction, and stabilization. Models in succession – facilitation, inhibition, and tolerance, Succession theories – mono climax theory, climatic climax, and subordinate communities- disclimax, sub climax, pre-climax, post-climax, poly climax theory- edaphic climax, biotic climax. climax pattern theory, communities in geographical gradients- individualistic hypothesis and interactive hypothesis.

Module III: ***Community Ecology:*** Community dynamics, Qualitative characters- physiognomy, stratification, profile diagram, life forms- Raunkiaer's system of classification, phenology, periodicity, aspection, sociability – Braun Blanquet approach,

Module IV: ***Forest types of Kerala and Western Ghats:*** Forest types in Kerala based on revised classification of Champion and Seth – Characteristics, vegetation structure, and species composition of major forest types of Kerala- 1A/C3, 1A/C4, 1/E2, 1/2S1, 2A/C2, 3B/C1, 3B/C2, 4B/TS2, 4C/FS1, 4C/FS2, 4E/RS1, 5A/C3, 6A/C1, 11A/C1, 11A/DS2, Forest types of Western Ghats based on Gadgil and Meher-Homji classification- biogeographic provinces and potential maximum vegetation types.

Practicals: -

1. Vegetation structure and species composition of major forest types in Kerala
2. Create a profile diagram of forest ecosystem
3. Study the frequency of species in a given area and compare the frequency distribution with Raunkiaer's standard frequency diagram.
4. Measurement of biomass and productivity
5. Quantification of litter production and decomposition
6. Estimation of species abundance by line transect, belt transect method, quadrate method

References: -

1. *Champion, H.G and Seth, A.K. 2005. Revised survey of the forest types of India. Natraj publishers. 404 p.*
2. *Gadgil, M and Meher-Homji, V.M. 1990. Ecological diversity. In: Conservation in developing countries: problems and prospects. Daniel, J.C, and Serrao, J.S (eds). Bombay Nature History Society, Bombay, and Oxford University Press, Bombay, p. 175-198.*
3. *Michael P. 1990. Ecological Methods for Field and Laboratory Investigations. Tata McGraw-Hill Pub.Co. New Delhi, 404p*
4. *Misra KC. Manual of Plant Ecology. Oxford & IBH Pub Co. New Delhi. 491p*
5. *Odum, E.P. 1996. Fundamentals of Ecology. Natraj Publishers, Dehra Dun 574p.*
6. *Saggwal, S.S. 2021. Forest Ecology. Scientific Publishers, India. 368p*

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MSFOR01C04 – FUNDAMENTALS OF WILDLIFE SCIENCE

Hours per week: 4+2 **Credit: 4**

Course Outcomes:

- Understand the process of evolution and early radiation of life on earth.
- Acquire the basic knowledge on mammalogy, ornithology, herpetology and ichthyology
- Understand the importance and values of wildlife
- Identify common birds, mammals, reptiles and amphibians

Module I: ***Introduction to Wildlife Science:*** Geological time scale and the evolution of life. History of evolutionary thought; natural selection and speciation. Concept of species. Detailed classification of Chordata. Definition and values of wildlife. Characteristics of wildlife in different biomes and zoogeographic regions of the world.

Module II: ***Mammalogy and Indian mammals:*** Characteristics of class mammalia. Classification of mammals and the detailed account on mammalian orders of Indian sub-continent: Primata, Carnivora, Proboscidea, Perissodactyla, Artiodactyla, Pholidota, Rodentia, Eulipotyphla, Scandentia, Lagomorpha, Chiroptera, Cetaceae and Sirenia. Zoogeography of Indian mammals.

Module III: ***Herpetology and Ichthyology:*** Herpetology and the major reptiles and amphibians of India with special reference to Western Ghats. Breeding biology of reptiles and amphibians. Role of temperature in sex determination in reptiles. Identification of venomous and nonvenomous snakes. Snake bites, Venom, Anti-venom, First Aid and Management of snake bite cases. Conservation problems and challenges of herpetofauna of Indian sub-continent. Methods for herpetofauna ecological studies. Classification and diversity of major groups of fishes in India. Ichthyogeography of freshwater fishes of India. Ecology and adaptation of fishes in different ecosystems. Threats and conservation challenges of fishes in India. Methods for ecological studies of fishes.

Module IV: ***Ornithology:*** Ornithology and brief knowledge on bird morphology. Avian classification and distribution with special reference to Indian birds. Morphological, physiological and anatomical adaptations in birds. Types of feathers, bills and claws. Bird ecology and behaviour – feeding, nesting and parental behaviour, locomotion, communication, and reproductive behaviour - courtship displays, territory, and mating behaviour. Types of bird flight and flight adaptations. Bird migration – reasons, patterns and mechanics of migration. Threats faced by the avian community. Bird conservation and management in India. Important Bird areas and Ramsar sites.

Practicals: -

1. Study of characteristics of wildlife in different biogeographic zones of India
2. Field identification of larger mammals of the orders Primata, Carnivora, Proboscidea, Perissodactyla, Artiodactyla, Pholidota, and Lagomorpha
3. Morphological features of various families under order chiroptera
4. Field identification small mammals of Rodentia and Eulipotyphla
5. Visit to different bird habitats viz. forests, wetlands, shore areas, urban areas etc. and field identification of birds.
6. Field identification of reptiles and amphibians of Western Ghats
7. Study on venomous and nonvenomous snakes
8. Study of feathers, beak and leg types of different groups of birds.
9. Birds skin preparation.
10. Acquaintance with the online citizen science platforms for bird monitoring.

References: -

1. *Daniel JC. 1980. Book of Indian reptiles. OUP*
2. *Dasmann, R.F. 1982. Wildlife Biology. Wiley Pub. New York.*
3. *Gee EP. 2000. The wildlife of India. Harper Collins Publication.*
4. *Grimmet, R. Inskipp T and Inskipp, I. 2000. Pocket Guide to the of Birds of Indian subcontinent. Christopher Helm series.*
5. *Indraneil Das. 1987. Turtles and Tortoises of India, OUP*
6. *Johnsingh AJT. (Ed.). 2003. The Mammals of South Asia: Ecology, Behaviour and Conservation.Permanent Black.*
7. *Neelakantan,K.K. 1984. "KeralathilePakshikal". Kerala Sahithya Academy, Thrissur. 584pp.*
8. *Prater, S.H. 1971. The Book of Indian Animals. Oxford University press, Bombay.*
9. *Ranjit Daniels. Freshwater Fishes of Peninsular India. Indian Academy of Sciences*
10. *VivekMenon. 2003. Field Guide to Indian Mammals. Penguin Books, India.*
11. *Whitaker R and Ashok Captain. 2004. Snakes of India: The Field Guide. Draco Books, Chennai.*

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MSFOR02C06 - NURSERY TECHNIQUES & PLANTATION FORESTRY

Hours per week: 4+2 **Credit: 4**

Course Outcomes:

- Develop skills in seed processing, nursery techniques and plantation management
- Understand management activities done in different plantations across the world
- Select trees species for different afforestation programmes
- Understand the major pests and disease affecting plantations and its management

Module I: ***Seed Technology***: Importance of seed in Nursery Establishment - Planning seed collection- Methods of seed collection. Fruit and seed handling - Seed processing for nursery sowing- methods of extraction. Seed storage- definition- purpose. Seed dressing and pelleting. Seed testing - definition- ISTA rules. Germination evaluation- germination testing in nursery. Emerging trends in tropical seed technology.

Module II: ***Nursery Techniques:*** Scope of Nursery technology in relation to plantation forestry. Nursery establishment - site selection – planning, and layout of nursery area. Pre-sowing treatments. Containerized nursery technique - advantages, disadvantages - root deformations - container designs and types/root trainers and rooting media. Methods for field handling and planting. Nursery practices for important plantation species.

Module III: ***Plantation Forestry*****:** Importance and status of plantation in India and world. Purpose of plantation, factors determining scale and rate of plantation, land suitability and choice of species. Various Steps in plantation and its management- planning, preliminary site preparation, planting programme (time of planting, spacing and pattern, planting methods). Emerging concepts in plantation forestry: mixed plantation, continuous cover forests. Plantation forestry for climate change mitigation- carbon forestry. Ecological factors and long term productivity. Sustainable yield from plantations.

Module IV: ***Plantation pests and diseases-*** Major pest and disease in plantations -sanitation and control measures. IPM and INM in plantations. Case studies in plantations of teak, mahogany, eucalyptus, casuarina, poplars, acacias, pine, silver oak, gmelina, sandal, bamboo. Wasteland afforestation, Industrial Plantations, Mixed plantations.

Practicals:

1. Introduction and identification of modern equipment and tools used in nursery;
2. Planting geometry and calculation of planting stock/ seed requirement
3. Seed Quality testing
4. Study the morphological description and field identification characteristics of trees seeds and seedlings.
5. Planting and stand management practices of Multipurpose trees(MPTs) and Bamboos
6. Field Visit to Forest plantations and wood logs.

References:

1. *Baldwin HI. 1942. Forest Tree Seed of the North Temperate Regions. Periodical Experts Book Agency, Delhi.*
2. *Bedell PE. 1998. Seed Science and Technology: Indian Forestry Species. Allied Publisher Limited.*
3. *Chaturvedi AN. 1994. Technology of Forest Nurseries. Khanna Bandhu.*
4. *Chin HF and Roberts EH. 1980. Recalcitrant crop seeds. Tropical Press Sdn. Bhd. Malaysia.*
5. *Dutta M and Saini GC. 2010. Forest Tree Improvement and Seed Technology.*
6. *Dwivedi AP. 1993. A Text Book of Silviculture. International Book Distributors, Dehradun.*
7. *Dwivedi AP. 1993. Forestry in India. Suya Publ.*
8. *Evans J. 1982. Plantation Forestry in the Tropics. Clarendon Press,Oxford.*
9. *Khanna, L.S. (1989). Principles Practice of Silviculture. Khanna Bandhu, New Delhi, 473p.*
10. *Kumar V. 1999. Nursery and Plantation Practices in Forestry. Scientific Publ.*
11. *Luna RK. 1989. Plantation Forestry in India. International Book Distributors.*
12. *Ram Prakash, Chaudhari DC & Negi SS. 1998. Plantation and Nursery Techniques of Forest Trees. International Book Distributors.*
13. *Smith DM, Larson BC, Ketty MJ & Ashton PMS. 1997. The Practices of Silviculture-Applied Forest Ecology. John Wiley & Sons.*

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MSFOR02C07 - FOREST BIOMETRY

Hours per week: 4+3 **Credit: 4**

Course Outcomes:

- Understand and carry out measurements of individual trees and forest stands
- Familiarize forest sampling and inventory techniques
- Estimate of growth and yield obtained from forest stands
- Determine the site quality of different forests

Module I: ***Measurement of tree parameters:*** Diameter and girth measurements, Standard rules governing breast height measurements- instruments used for girth and diameter measurements, measurement of bark thickness-bark gauge. Tree height definitions- Total height, bole height, commercial bole height, crown length and crown height, Measurement of tree height- ocular, non-instrumental and instrumental methods. Tree stem form- form factor types, form height, form quotient, form class

Module II: ***Volume measurement of trees:*** Volume of standing trees, volume of logs-Smalions formula, Hubers formula, Newton's formula, Quarter girth formula, Volume tables-Classification and preparation of volume tables.

Module III: ***Forest Sampling Techniques:*** Kinds of enumeration, choices of kinds of enumeration, kinds of sampling – random sampling- simple random sampling, stratified random sampling, multi-stage sampling, multi-phase sampling, sampling with varying probability-list sampling, non-random sampling- selective sampling, systematic sampling, sequential sampling, sampling errors, and non-sampling errors. Kinds of sampling units- fixed area and point sampling units. Horizontal and vertical point sampling.

Module IV: ***Measurement of forest stands:*** crop diameter, crop height, crop age, crop volume, estimation of growth and yield prediction in a forest stand, stand structure, growth of stand-methods of determining the past growth of stand, methods of predicting the future growth of stands- stand density, canopy density, crown competition factor, maximum crown area, site quality evaluation- yield table- contents, kinds, preparation and uses, stand table- definition and uses.

Practicals: -

1. Measurement of tree height using various instruments
2. Measurement of tree girth using various instruments
3. Measurement of tree diameter using various instruments
4. Measurement of bark thickness using various instruments
5. Estimation of canopy cover using spherical densiometer.
6. Calculation of the volume of felled trees and standing trees
7. Preparation of volume tables
8. Determination of site quality

References: -

1. *Chapman, H.H and Meyer, W.H. 2008. Manual of Forest Mensuration: Methods and Techniques, Asiatic publishing house, 522p.*
2. *Chaturvedi A, N, and L.S Khanna, 1982. Forest Mensuration, International Book Distributors, Dehradun, 403p.*
3. *Chaturvedi A, N, and L.S Khanna, 2011. Forest Mensuration and Biometry, Khanna Bandhu, Dehradun, 364p.*
4. *Heindjik, D. 1975. Forest Assessment, International Book Distributors, 349 p.*
5. *Kangas, A and Maltamo, M. 2006. Forest Inventory: Methodology and Applications, Managing Forest Ecosystems. Springer 340 p.*
6. *Shiver, B.D and Borders, B.E. 1996. Sampling techniques for Forest Resource Inventory. John Wiley and Sons, 356 p.*

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MSFOR02C08 – CONSERVATION BIOLOGY AND CAPTIVE WILDLIFE MANAGEMENT

Hours per week: 3+2 **Credit: 4**

Course Outcomes:

- Understand the importance of biodiversity and its uses and values.
- Describe the major threats to biodiversity and the causes of species extinction.
- Evaluate the effectiveness of different conservation strategies and approaches.
- Analyze and apply conservation tools and techniques in practical situations.

Module I: ***Principles of Conservation Biology and Biodiversity:*** Definition, principles and scope of conservation biology. Early school of thoughts in conservation biology. Biodiversity – definition, levels, uses and values. Spatial classification of biodiversity – Alpha, Beta and Gamma diversity. Measures of diversity, richness, evenness. India as a mega biodiversity nation. Endemism, rarity and extinction of species. Extinction processes and rates – causes of extinction. Ethics in conservation biology. Environmental justice and equity.

Module II: ***Conservation Genetics:*** Phylogenetics and species delineation. Phylogenetic diversity and conservation. Population density and inbreeding – genetic drift. Population habitat viability analysis. Assessing cryptic diversity and DNA barcoding. Conservation consequences of hybridization.

Module III: ***In situ Conservation and Protected Areas:*** *In situ* conservation measures. Protected areas – concept and design. Protected area network in India. National Parks, Wildlife Sanctuaries, Community Reserves and Conservation Reserves. Conservation efforts - Worldwide and in India. MAB programme and Biosphere reserves. Major conservation projects. NTCA and tiger conservation in India. IUCN redlist categories and criteria.

Module IV: ***Ex situ Conservation and Captive Wildlife Management:*** *Ex situ* conservation measures. Zoological Gardens in India. Objectives and types of zoo. Conservation through captive breeding and reintroduction of endangered wild animals. Conservation breeding Management Plans, Role of scientific institution and NGOs in Conservation Breeding Programmes. Understanding biological requirements of species; design of facilities: food, hygiene, disease control, breeding. Case studies on Conservation Breeding Programme of endangered wild animals in India. Central Zoo Authority and its guidelines on the zoological gardens in India. Nutrition and health care of captive wildlife according to CZA. Capture and handling of animals - purpose, restraint techniques, different capture methods and animal barriers. Drug immobilization - drug delivery equipment and accessories. Immobilization drugs - action, dosage, response and side effects, safety measures, complications. CZA protocol of handling and transport of wild animals, designing sledge, crate and holding enclosures.

Practicals: -

1. Conduct a field survey and estimate the Simpson's and Shannon-weiner diversity indices, Berger-parker dominance index , quantitative and qualitative similarity indices.
2. Visit to local Zoo and record disease, health management practices of various animals.

3. Demonstration of equipment used in capturing and handling of wild animals.
4. Major viral, bacterial, protozoan, fungal and parasitic diseases of Indian wild mammals, birds, amphibian and reptiles.
5. Calculation of Minimum Viable Population
6. Calculation of inbreeding coefficient
7. Visit a protected area and evaluate the effectiveness of conservation programmes implemented.

References: -

1. *Hunter, L.M. and Gibbs, J.P. (2006). Fundamentals of Conservation Biology, 5th Edition. Wiley-Blackwell Publications, New Jersey, USA. 516 pp.*
2. *Primack, R.B. 1993. Essentials of Conservation Biology. Soiner, MA.*
3. *Piank, E.R. 1981. Competition and niche theory. In Theoretical Ecology. May (ed).*
4. *Pielou, E.C. 1975. Ecological Diversity. Wiley Interscience Pub.*
5. *Magurraan ,A. (1983). Ecological diversity, University press Cambridge*
6. *Wildlife Ecology and Management, by W.L.Robinson & E.G.Bolen. Mc.Millan Publ. Comp. New York.*
7. *Managing Protected Areas in Tropics, by J.K.Mackinnon, Natraj Publ. Dehradun.*
8. *Sahoo A. K. 2011. The Text Book of Forest Ecology, Biodiversity and Conservation. Indian Books and Periodicals. New Delhi.*

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MSFOR02C09 - RESEARCH METHODOLOGY AND BIOSTATISTICS

Hours per week: 4+3 **Credit: 4**

Course Outcomes:

- Understand the various research methods and techniques
- Develop the ability to formulate research questions and objectives
- Acquire skills in data analysis
- Interpret Statistical Results

Module I: ***Introduction to Research:*** Novelty, Originality, Organized Method of Investigation, and Communication of Problem, Data, Method, and Results.Types of Research- Theoretical, Empirical, Experimental. Modes of Inquiry and Inquiring Systems: Hypothetico-deductive and Empirical-inductive modes.Research Topic, Problem, Questions, Objectives, and Scope Research Methodology, Methods, Tools, and Techniques. Research Ethics, Plagiarism and Their Prevention.

Module II: ***Research Documentation:***Elements of Preparing a Paper and a Thesis- Title, Abstract, Keywords, Acknowledgements, Symbols and Abbreviations, Introduction, Literature Review, Materials and Methods, SI Units, Mathematical Materials, Graphical and Tabular Presentation, Results and Discussion, Conclusion, Interpretation, Generalization, Scope for Future Work, Citations and List of References, and Appendixes.

Module III: ***General Statistical Methods:***Scales of measurement, important variables of forestry sector. Probability distributions (Binomial, Poisson, Normal). Correlation and regression: SimpleandRank, correlations.Linear and nonlinear regressions, parabolic, exponential, power and logarithmic functions. Tests of significance – t, F, z, and $\chi 2$, testing significance of correlation and regression coefficients, analysis of variance (ANOVA) – one way and two-way classification with single and more than one cell frequency.

Module IV: ***Design of Experiments:*** Principles of experimental designs, Completely Randomized Design (CRD), Randomized Block Design (RBD), Latin Square Design (LSD), Row- Column (alpha) designs, Split Plot and Strip Plot Designs. Sampling – Theory and applications. Simple Random, Sampling (with and without replacement), Stratified Random Sampling, Double sampling, Multistage sampling, Cluster sampling.

Practicals: -

1. Preparation of Questionnaires and collecting data.
2. Citing information gathered from different media.
3. Paraphrasing an article
4. Oral presentation of a Research report.
5. Problems on probability-fitting of binomial distribution
6. Fitting of linear regression models for prediction
7. Fitting of Poisson distribution , problems on normal distribution
8. Computation of correlations

9. Tests of significance – t, F, z, Chi –square test, test of goodness of fit – test of independence of attributes in a contingency table - computation of mean – square contingency
10. Analysis of variance-construction of ANOVA table of one-way classified data.
11. Analysis of variance-construction of ANOVA table of two-way classified data.
12. Selection of simple random sample – estimation of parameters – sample size Determination
13. Selection of stratified random sample–equal, proportional and Neyman's allocation in stratified sampling
14. Lay out and analysis of CRD, Lay out and analysis of RBD
15. Analysis of data from 2^n factorial experiments in RBD. Formation of Yate's table calculation of main effects and interaction effects.

References: -

1. *Ackott, R.L. and Sasieni, M.W. 1984. Fundamentals of operational research. Wiley Eastern, New Delhi*
2. *Anderson, R.L. and Bancroft, T.A. 1952. Statistical Theory in Research. Mc.Graw Hill Book Co.,NewYork.*
3. *Cochran,W. Gand Cox, G.M. 1958. Experimental designs. Wiley, New York*
4. *Das, M.N. and Giri, N.C. 1986. Design and analysis of Experiments. Wiley Eastern Ltd., New Delhi.*
5. *Goon, A.M., Gupta, M.K. and Dasgupta, B. 1983. Fundamentals of Statistics. Vol.1. The World Press Pvt. Ltd., Calcutta.*
6. *Gupta, S.C., and Kapoor, V.K. 2014. Fundamentals of Applied Statistics. Sultan Chand & Sons; Fourth edition*
7. *Hawkins, C. and Sorgi, M. (Ed.). 1984. Research How to Plan, Speak and write about it. Narosa Publishers, New Delhi*
8. *Hillway, T. 1964. Introduction to Research, 2nd ed., Boston: Houghton Mifflin.*
9. *Kothari, C. R. 2009. Research methodology: Methods and Techniques. Viswa Prakashan New Delhi.*
10. *Thomas, C George. 2020. Research Methodology and Scientific Writing 2nd Edition.*
11. *Verma, R.K. and Verma Gopal. 1988. Methodology and Technique of Research. Arnold Publishers, New Delhi.*

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MSFOR03C11 - WILDLIFE MANAGEMENT AND MONITORING TECHNIQUES

Hours per week: 3+2 **Credit: 4**

Course Outcomes:

- Understand the principles and goals of Wildlife Management
- Assess and monitor wildlife populations using appropriate techniques.
- Evaluate and implement habitat management strategies for wildlife conservation.
- Analyze the impacts of hunting, trapping, and predator control on wildlife populations.

Module I: Introduction to Wildlife Management: Definition, objectives, and scope of wildlife management. Historical development and key milestones in wildlife management in India. Challenges and contemporary issues in wildlife management.

Module II: Wildlife Monitoring and Population Assessment: Wildlife census – Purpose and techniques. Direct and indirect methods. Direct methods – Line transect for direct sighting, Total count, block counts, road side counts, water hole count. Indirect methods – strip transects for indirect evidences of tracks and signs, dung count method for elephants and gaur, pug mark census. Use of camera traps, Sherman traps, mist nets, harp traps, drones, molecular tools, acoustic tools. Radio telemetry and tracking studies. Visual tagging, marking, PIT tags and ringing in birds. Mark-recapture methods and statistical modeling. Distance sampling and estimating animal densities and abundance. Designing occupancy surveys and data collection. Estimating species occurrence and detection probabilities.

Module III: Habitat Management for Wildlife: Habitat requirements and management strategies for different species. Landscape-level conservation planning and habitat connectivity. Importance and need for restoration of wildlife corridors. Use of geospatial tools for habitat suitability analysis. Zoning of protected areas.

Module IV: Human Dimensions in Wildlife Management: Reasons for human-wildlife conflicts. Impacts of human activities on wildlife populations. Wildlife habitat destruction and emerging zoonoses. Conflict resolution and mitigation of human-wildlife conflicts. Culling as a wildlife management tool. Management strategies for wildlife in national parks and reserves. Ecodevelopment – Community participation and conservation development linkage. Ecotourism and its role in wildlife conservation. Balancing visitor access and wildlife protection.

Practicals: -

1. Field exercise on wildlife census techniques - direct methods
2. Field exercise on wildlife census techniques - indirect methods
3. Field study on tracks and signs
4. Field exercise on camera trap survey
5. Survey for small mammals using Sherman traps
6. Bat monitoring using harp traps, mist nets and bat detectors

7. Estimation of population using Mark-recapture method.
8. Estimation of bird species richness by Mckinnon's method.

References: -

1. Sutherland, W.J. and Krebs, C.J., 1997. Ecological census techniques. *Trends in Ecology and Evolution*, *12*(2), pp.81-81.
2. Karanth, K.U. and Nichols, J.D. eds., 2002. *Monitoring tigers and their prey: a manual for researchers, managers, and conservationists in tropical Asia*. Centre for Wildlife Studies.
3. Donnelly, M.A., Guyer, C., Juterbock, E.J. and Alford, R.A., 1994. Techniques for marking amphibians. *Measuring and monitoring biological diversity: standard methods for amphibians*.
4. Rajesh, G. 1989. Fundamentals of Wildlife Management. Justice Home, Allahabad.
5. Sukumar, R., 1992. *The Asian elephant: ecology and management*. Cambridge University Press.
6. Singh, L. A. K. 2000. Tracking Tigers: Guidelines for estimating wild tiger populations using the 'Pugmark Technique': Revised Edition. WWF Tiger Conservation Programme.

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MSFOR03C12 - FOREST HEALTH AND PROTECTION

Hours per week: 3+2 **Credit: 4**

Course Outcomes:

- Identify various forest pests in plantations and natural forests
- Identify various diseases in plantations and natural forests
- Understand the concept of forest health
- Discuss the management of forest fire

Module I: Forest Health: Introduction and Definitions of Forest Health. Characteristics of a Healthy Forest. Forest Health Problems- symptoms and possible causes. Current Health Status of the World's Forests. Influence of Forest Management and other human activities on Forest Health: Case Studies. Forest Health Monitoring Networks, Forest Health Risk Rating, and Mapping. Invasive Alien Species (IAS) and its management.

Module II: Forest Pest Management: Insect pest-induced loss assessments in Forest nurseries and forest plantations in India. Important insect pests of forest nurseries, forest plantations, avenue trees, seeds of major forest trees, and their management.

Module III: Forest Disease Management: Disease-induced loss assessments in Forest nurseries and Forest plantations in India. Important diseases of forest Nurseries, forest plantations, avenue trees, and their management. Mycoflora of seeds and their management. Principles of diseases management, Development of disease management system. Modeling forest diseases.

Module IV: Forest Fire Management: Causes and Impacts of forest fire on ecosystem. Forest fire incidences in different forest types, Fire management strategies, advanced tools for fire-fighting, modern methods of forest fire control, Forest fire management cycle, Fire risk zone mapping and modeling, MoEFCC Report on strengthening forest fire management in India, Integrated Forest Protection scheme and IFMS, Forest fire monitoring programmes of FSI- Fire Alert system (FAST) and Large Forest Fire (LFF) monitoring.

Practical

1. Disease assessment (incidence and severity) in nursery seedlings
2. Pest assessment (incidence and severity) in forest nurseries
3. Pest assessment (incidence and severity) in forest plantations
4. Familiarize various forest fire management strategies of KFD
5. Assessment of impacts due to forest fire
6. Identification and management of Invasive Alien Species in nearby forest
7. Determination of health index of natural forests

References

1. Fuller, M. 1991. Forest Fires: An Introduction to Wildland Fire Behavior, Management, Firefighting, and Prevention. John Wiley and Sons, 238 p.
2. Joint Report by Ministry of Environment, Forest, and Climate Change, GOI and World Bank, 2018. Strengthening Forest fire management in India. 234 p.
3. Khanna, L.S. 2015. Forest Protection, Khanna Bandhu, Dehradun, 232 p.
4. Parthasarathy, S., Thiribhuvanamala, G., Muthulakshmi, P and K. Angappan. 2021. Diseases of forest trees and their management. CRC press. 388 p.
5. Robert L Edmonds, James K Agee, and Robert I. Gara, 2011. Forest Health and Protection. McGraw-Hill publishers. 648 p.
6. Speight, M. R and Wylie, F.R. 2012. Insect pests in Tropical Forestry. CABI publishing. 376 p.

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MSFOR03C13 - FOREST RESOURCE MANAGEMENT AND UTILIZATION

Hours per week: 3+2 **Credit: 4**

Course Outcomes:

- Understand the structure, composition, and functioning of forest ecosystems
- Develop forest management plans considering ecological, economic, and social factors
- Understand the principle, process and schemes of forest certification
- Get basic knowledge of ecosystem services evaluation

Module I: Forest Management: Ecological, Social and Economical pillars of management, Criteria and Indicators, Sustainable Forest Management-Bhopal-India Process, Criteria and indicators for SFM. Progressive yield concept and meaning. Normal Forest: definition and concept; Yield regulation –type, basis of yield regulation

Module II: Forest certification: Forest certification schemes, standards, agencies. status of forest certification in India. Marketing of certified forest products- Timber and Non-timber Forest Products. Green Building Standards and Certification Systems. Mechanisms of benefit sharing, Eco-certification, Intellectual Property Rights and Geographic Indications, Forest Stewardship Council, Landscape labelling. Case studies on certification and geographical indications.

Module III: Forest Ecosystem Valuation: Ecosystem Services -basics, importance, history of ES and natural capital. Quantification and Valuation- Direct and indirect approaches. Valuation methods- Market price-based approach, productivity and cost-based approaches, stated preference approaches. Challenges in valuation.

Module IV: Forest Working Plan: Forest planning, evaluation and monitoring tools and approaches for integrated planning; multipurpose development of forest resources and forest industries development; working plans and working schemes, their role in nature conservation, biodiversity and other dimensions; preparation and control. Divisional Working Plans, Annual Plan of operations.

Practicals: -

1. Visit to different forest divisions to study the various stand management aspects including thinning, felling and sale of timber.
2. Visit to forest plantation- Working Plan field exercises.
3. Visit to Working Plan Division- field exercises for data collection for working plan in natural forest
4. Exercise on assessment of growing stock and stock mapping.

References:-

1. Balakathiresan, S. 1986. *Essentials of Forest Management*, Nataraj Publishers. Dehra Dun.
2. Desai, V. 1991. *Forest Management in India–Issues and Problems*. Himalaya Pub. House, Bombay.
3. Edmunds, D and Wollenberg, E. 2003. *Essentials of Forest Management*. Natraj Publishers, Dehra Dun.
4. Jeffers .JN.R. 1978. *An Introduction to System Analysis with Ecological Application*. Edward Arnold.
5. National Working Plan Code 2014. MoEF, New Delhi.
6. Negi, S.S. 1984. *Scientific Management of Forest*. Bishen Singh Mahendra Pal Singh, Dehradun. 123 p.
7. Newman, E.I. 2000. *Applied Ecology*. Blackwell Scientific Publisher, U.K.
8. Osmaston, F.C. 1984. *The management of Forests*. International Book distributors, Dehra Dun, India
9. Paulo E.L.D. and Nunes. 2014. *Handbook on the Economics of Ecosystem and Biodiversity*. E-book.
10. Prakash, R. 1986. *Forest Management*. International Book distributors, Dehra Dun, India
11. Recknagel, A.B. and Bentley, J. 1985. *Forest Management*. International Book distributors, Dehra Dun, India
12. Sander J, Nicolas D and Hans K. 2014. *Ecosystem Services: Global Issues and Local Practices*. First Edition. Elsevier Publications.

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MSFOR03C14 - GLOBAL CHANGE ECOLOGY AND ECOSYSTEM RESILIENCE

Hours per week: 3+2 **Credit: 4**

Course Outcomes:

- To make students aware of scenario of climate change and to provide exposure on resilience of species in nature
- To develop a thorough grasp of the processes by which communities, ecosystems, and living things are adapting to climate change
- To connect closely with the main literature and choose subjects at the cutting edge of global change study
- To develop communication skills for science and familiarize oneself with techniques and instruments for forecasting future reactions to climatic change.

Module I: ***Global Change Ecology:*** Introduction and overview of global change ecology, earth climate system, greenhouse gases, and greenhouse gas effect, resources and the global commons, Human population, energy, patterns of consumption & emissions, global carbon cycle, Global ecology of CH_4 and N_2O, Our future climate: global and regional predictions.

Module II: ***Impacts of Change:*** Climate change impacts on plants and animals, Climate change impact on biodiversity and communities, Impacts of climate change on ecosystem and resources - Climate change and water resources, Impact of global warming on aquatic life Marine Impacts and Acidification, Coral bleaching and diseases.

Module III: ***Assessing Impacts and Vulnerabilities*****:** Understanding Vulnerability: Key concepts of Sensitivity and Vulnerability; Methods of Vulnerability Assessment; Indicators of vulnerability and livelihood; Climate sensitivity analysis; Uncertainties in prediction and detection; Vulnerabilities and adaptation practices in forestry, agriculture, soil & land, water resources; Measures for heat waves, coastal inundation – cities – critical infrastructure; Global Policy on Climate and Adaptation.

Module IV: ***Resilience:*** Introduction, why resilience, resilience and stability of ecological systems, resilience of terrestrial ecosystems, regime shift, resilience and biodiversity in ecosystem management. Ecosystem/biodiversity management under global change, climate change politics and negotiations: Case studies.

Practicals:-

1. Monitoring Sea surface temperature and its effect on coral bleaching
2. Questionnaire survey on Vulnerability Assessment and Climate sensitivity analysis in various urban and rural landscapes
3. Inundation studies across different coastal areas of Kannur

4. Monitoring the impacts of urban green islands on global climate change

References:

1. Rathinasamy, M, Chandramouli S. Phanindra K.B.V.N. Uma Mahesh 2018, Resources and Environmental Engineering II: Climate and Environment
2. Parry, ML et al. Climate change 2007: Impacts, Adaptation and Vulnerability, Cambridge University Press.
3. Patt, A et al. 2009 Assessing Vulnerability to global environmental change: making research useful for adaptation decision making policy, Earth scan London.
4. Climate Change and Biodiversity; By Thomas E. Lovejoy, Lee Jay Hannah Published by Yale University Press, 2006 ISBN 0300119801, 80300119800 418 pages.
5. William H. Schlesinger. 1997. Biogeochemistry: An Analysis of Global Change. Academic Press, San Diego, CA. 2nd edition. Available at the Bay Tree Bookstore.
6. Global Environmental Change: Research Pathways for the Next Decade, National Research Council, 1999.
7. Our Common Journey: A Transition toward Sustainability, National Research Council, 1999.
8. Shifting plant phenology in response to global change. Trends in ecology & evolution, 22(7), Cleland, E.E., Chuine, I., Menzel, A., Mooney, H.A. and Schwartz, M.D., 2007.pp.357-365.
9. Shifts in phenology due to global climate change: the need for a yardstick. Proceedings of the Royal Society B: Biological Sciences, 272(1581), Visser, M.E. and Both, C., 2005, pp.2561-2569.
10. Regional decline of coral cover in the Indo-Pacific: timing, extent, and subregional comparisons. PLoS one, 2(8), Bruno, J.F. and Selig, E.R., 2007, p.e711.

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MSFOR04C15 - FORESTRY EDUTOUR

Hours per week: Nil **Credit: 2**

Course Outcomes:

- Familiarize the flora and fauna of different forest types of the states/parts of India
- Understand the research activities of various research institutes, and other organizations related to forestry research in the state and other parts of India
- Understand the management practices to be followed in protected areas, zoos, and other captive breeding centres
- Exposure to various National/heritage monuments as part of the National Integration Activity.

Modules

- Visit natural forests of the states/parts of India to familiarize the structure, species composition and identify the forest types
- Visit to protected areas (wildlife sanctuaries or National parks) to familiarize the wildlife management practices
- Visit an ecotourism site to identify visitor satisfaction level, estimate the tourism carrying capacity, develop an alternate ecotourism product plan with existing facilities in the area, and conduct a stakeholder analysis
- Visit state/national research institutes to get exposure to the research activities and conservation efforts ongoing in the field of forestry.
- Visit zoos, wildlife safari, and captive breeding centres of states/parts of India to study the animal behaviors, breeding programs, and other conservation activities of the institutes.
- Visit various national heritage monuments of state or parts of India as part of the National Integration Activity

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KANNUR UNIVERSITY

SCHEME AND SYLLABUS

FOR

ELECTIVE COURSES

OF

M.Sc. FORESTRY (WILDLIFE MANAGEMENT)

UNDER

CHOICE BASED CREDIT AND SEMESTER SYSTEM
(OBE – Outcome Based Education – system)

With effect from 2023 admission

MSFOR03O01 - ECOTOURISM AND WILDLIFE PHOTOGRAPHY

Hours per week: 3+2 **Credit: 4**

Course Outcomes:

- Understand the different forms and categories of tourism.
- Understand the objectives and principles of ecotourism
- Demonstrate a comprehensive understanding of the principles and techniques of wildlife photography and framing techniques to create visually compelling wildlife images.
- Select and effectively utilize appropriate gear and equipment for different wildlife photography scenarios and apply post-processing and image editing techniques to enhance and refine wildlife photographs while maintaining authenticity.

Module I: ***Ecotourism Fundamentals and Concepts:*** Tourism-definition and history- Forms and categories of tourism. Classification of tourism. Dimensions and basic components of tourism. Ecotourism-definition and elements of ecotourism. Principles and objectives of ecotourism. Potential of ecotourism in India. Forms of ecotourism- hard and soft ecotourism. Stakeholders in ecotourism. Organizations and NGO's promoting ecotourism. Environmental and social impacts of ecotourism. Ecotourism and sustainable development.

Module II: ***Ecotourism in protected area:*** Planning ecotourism in protected areas-Carrying capacity and Zoning, Ecotourism in important protected areas of India- Keoladeo National Park, Kanha National Park, Sundarbans Tiger Reserve, Jim Corbett National Park, Periyar Tiger Reserve, Wayanad Wildlife Sanctuary, Parambikkulam Tiger Reserve, Thenmala Ecotourism and Bandipur National Park.

Module III: ***Basic elements of Wildlife Photography:*** Photography and overview of wildlife photography as a genre. Essential gear and equipment for wildlife photography: Workings of different kinds of cameras and lenses. Use of light and speed for different kinds of photographs, motion photography: Camera settings and exposure for wildlife. Basic rules for composing good wildlife and nature photography. Ethical considerations in wildlife photography. Using photography as an effective tool for conservation story telling.

Module IV: ***Post-Processing and Image Editing:*** Introduction to post-processing software for wildlife photography. Adjustments for exposure: techniques for fine-tuning exposure and brightness, Color: Understanding color correction and white balance adjustments, contrast Enhancing, Sharpening techniques to emphasize fine details, textures, and features, and minimizing distractions Preserving authenticity and ethical considerations in post-processing. Storytelling and Portfolio Development.

Practicals:-

1. List out the major ecotourism destinations in Kerala
2. Visit an ecotourism site and carry out stakeholder analysis and social impact assessment
3. Estimation of carrying capacity (PCC, RCC and ECC) for a tourism destination
4. Prepare an ecotourism plan for a nearby destination
5. Specialized Wildlife Photography: Bird photography techniques, Macro photography, Nocturnal and low-light photography, artificial lighting and long-exposure photography at night.
6. Developing a narrative and storytelling approach in wildlife photography: Creating a compelling wildlife photography portfolio
7. Hands-on editing exercises using post-processing softwares: Adobe Lightroom, Adobe Photoshop, Capture One, GIMP.

References:-

1. Hosetti, B.B. 2007. Ecotourism development and management, Pointer publishers, Jaipur. 358p
2. Honey, M. 2008. Ecotourism and Sustainable development. Island Press. 551p.
3. Chiranjeev, A. 2008. Ecotourism planning and Development. JnanadaPrakashan.
4. Chiranjeev, A. 2008. Ecological, Social and Cultural aspects of Ecotourism. JnanadaPrakashan.
5. Chiranjeev, A. 2008. Concept of tourism. JnanadaPrakashan.
6. Aaradhana, S. 2009. Indian tourism, Wildlife tourism and Ecotourism. JnanadaPrakashan. 288p
7. John and Barbara Gerlach. 2012. Digital Wildlife Photography. Routledge. 224p.

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MSFOR03O02 - CONSERVATION LAWS AND EIA

Hours per week: 3+2 **Credit: 4**

Course Outcomes:

- Understanding the evolution of environmental laws in India, their scope and applicability.
- Explain the role of law and legal institutions in the conservation and management of natural resources.
- Understand the laws and policies at the national and international level relating to the environment
- Acquire skills needed for interpreting laws and judicial decisions

Module I: ***Forest, Wildlife, and Biodiversity related laws*****:** Evolution and Jurisprudence of Forest and Wildlife laws; Colonial forest policies; Forest policies after independence. Statutory framework on Forests, Wildlife and Biodiversity: IFA, 1927; WLPA, 1972; FCA, 1980; Biological Diversity Act, 2002; Forest Rights Act, 2006, WLPA (amendment-2020). National Water Policy and Kerala state policy. Pollution Control Boards. Judicial remedies and procedures Marine laws of India; Coastal zone regulations. Legal framework on Air pollution: Air Act,1981; EPA, 1986.

Module II: ***Environment protection laws:*** Legal framework on environment protection-Environment Protection Act as the framework legislation–strength and weaknesses; National Green Tribunal. Legal framework: EPA and rules made thereunder; introduction to international law; sources of international law; law of treaties; signature, ratification. Evolution of international environmental law: International Agencies: CITES, TRAFFIC, UNFCC. International Conventions: Ramsar Convention, The Basel Convention, The Montreal Protocol, International Tropical Timber Agreement. Convention on Biological Diversity 1992 (CBD) Cartagena Protocol on Bio-Safety 2000 (CPB)

Module III: ***Environmental Impact Assessment (EIA):*** Concepts of EIA, history of EIA, definition, and types of EIA, Environmental Impact Assessment and Environmental Impact Statement; EIA in the project cycle, EIA Notification, and legal and regulatory framework. Public consultation and participation in EIA process. EIA guidelines and review process. EIS formulation. New approaches to EIA and SEA (strategic environmental assessment).

Module IV: ***Methods in EIA:*** Screening and Scoping in EIA – Drafting of Terms of Reference, Baseline monitoring: air; water; noise; land and soil, microclimate, biodiversity, geology, hydrology, and hydrogeology. Baseline monitoring of Socio-economic environment – Identification of Project Affected Personal – Rehabilitation and Resettlement Plan-Economic

valuation of Environmental impacts – Cost-benefit Analysis

Practicals:-

1. Visit to Protected Areas and Divisional Forest Office to observe and familiarize implementation of different forest laws
2. Visit to different project sites and interaction with rehabilitees.
3. Prepare a model Environment Management Plan for the given project.
4. Familiarize Environmental Impact Assessment
5. Cost-benefit Analysis

References:

1. Baden Powell, B.H. 2002. Manual of Jurisprudence for Forest Officers. Materials, and Statutes, Oxford University Press.
2. Dutta, R. and Yadav, B. 2012. Supreme Court on Forest Conservation. Universal Law Publishing Co., New Delhi, India.
3. Forest Laws of Kerala, 1975. Ganesh Publications, Kochi.
4. Handbook of Environment, Forest and Wildlife Protection laws in India 1998. Natraj Publishers, Dehra Dun.
5. Joy, P. P. 2012. Set up your criminal practice. Swamy Law House, Ernakulam.
6. Roy P Thomas. 2011. Manual of forest laws in Kerala 3rd Edition. Em tee en Publications.
7. Shetty, B. J. 1985. A Manual of Law for Forest Officers, Sharda Press, Mangalore.
8. Divan, S.and Rosencranz, A. 2001. Environmental Law and Policy in India. Cases.
9. Takwani, C. K. T and Thakker, M. C. 2012. Takwani Criminal Procedure. Lexis Nexis Butterwarths, Wadhwa, Nagpur.
10. Varghese, M. I. 2012. Treatise on Forest Laws of Kerala. Swamy Law house, Ernakulam.

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MSFOR03O03 - ETHNOBIOLOGY

Hours per week: 3+2 **Credit: 4**

Course Outcomes:

- Analyze the relationships between human societies, biodiversity, and the environment.
- Assess the impacts of globalization and cultural change on traditional ecological knowledge.
- Evaluate the importance of ethnobiology in conservation and sustainable resource management.
- Recognize the ethical considerations and challenges in ethnobiological research and practice.

Module I: Ethnobiology and Traditional Ecological Knowledge: Definition, scope, and historical development of ethnobiology. Interdisciplinary nature of ethnobiological research. Cultural and ecological perspectives in ethnobiology. Traditional Ecological Knowledge-Definition-scope- Indigenous and local communities as custodians of TEK-Case studies showcasing TEK in different cultural contexts-Ethical considerations in accessing and utilizing TEK.

Module II: Ethnoecology and Biocultural Diversity: Interactions between culture, language, and biodiversity. Biocultural diversity hotspots and their significance. Indigenous conservation practices and community-based management. Role of ethnoecology in sustainable development. Bioprospecting- Challenges and controversies. Community-based approaches to conservation and benefit sharing. Collaborative research models and partnerships with indigenous communities.

Module III: Indigenous Knowledge Systems and Climate Change: Indigenous knowledge and adaptation strategies in the face of climate change. Indigenous perspectives on climate justice and environmental activism. Indigenous-led initiatives for climate change mitigation and resilience. Collaborative research and policy partnerships for climate action.

Module IV: Emerging Trends in Ethnobiology: Current debates and future directions in ethnobiology research. Integration of traditional and scientific knowledge systems. Innovations in ethnobiological data collection and analysis. Ethnobiology as a bridge between academia, indigenous communities, and policy.

Practicals:-

1. Visit to various tribal hamlets and document their local health traditions.
2. Ethnobotanical Surveys among local communities to document traditional plant knowledge, including the identification, uses, and preparation methods of plants for medicinal, culinary, or other purposes.
3. Collection and documentation of Traditional Ecological Knowledge
4. Ethnoecological Assessments
5. Studies on primitive tribes of Kerala

References

1. Anderson, E.N., 2011. *Ethnobiology*. Wiley-Blackwell Publications.
2. Bawa, K.S. and Nair, R. K. N., 2006. (Ed.). *Traditional Wisdom and Biodiversity Conservation in India*. Ashoka Trust for Research in Ecology and the Environment.
3. Gary Martin, 2011 (Ed.). *Ethnobiology for the Future: Linking Cultural and Ecological Diversity for Resilience and Sustainability*. Arizona University Press.
4. Jain, A.K., and Rastogi, R.P. 2010. *Ethnobiology in Human Welfare.* Capital Publishing Company.
5. Luisa Maffi and Ellen Woodley, 2010. *Ethnobiology and Biocultural Diversity*. Routledge Publications.
6. Rai, M. K., Arora, S. and Sharma, B. K. 2017. *Ethnobotany: Principles and Applications*. CABI India
7. Ulysses Paulino Albuquerque, 2005. *Ethnobiology: An Introduction.* Timber Press.

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MSFOR04E01 - WILDLIFE FORENSICS

Hours per week: 3+2 **Credit: 4**

Course Outcomes:

- Demonstrate a critical understanding of practical and ethical issues relating to the application of conservation genetics and wildlife forensics.
- Plan, apply and interpret the outputs of appropriate research and forensic techniques.
- Understand the basics of Wildlife Crime Investigation with Forensic Trace Collection, documentation and presentation of evidence in a courtroom.
- Understand the main theoretical and practical skills of personnel who investigate wildlife crimes.

Module I: ***Wildlife Forensics Fundamentals and Concepts:*** Overview of wildlife forensics and its significance, History and key milestones in the field. Forensic science principles and their application to wildlife cases Understanding the legal framework and regulations related to wildlife crime.

Module II: ***Species Identification and Crime Investigation Techniques:*** Methods for species identification (morphology, physical, anatomical, histological and chemical), protein based (electrophoretic- SDS-PAGE, Iso-electric focusing, Capillary electrophoresis etc.), immunological (AGID, ELISA etc.), DNA- based methods (hybridization, RFLP, AFLP etc.). Taxidermy techniques. Crime scene management and evidence collection: preservation and submission of clinical and autopsy samples, preservation and despatch of carcasses for autopsy. Introduction to forensic tools and equipment used in wildlife crime investigation. Forensic photography and documentation of evidence. Chain of custody and preservation of biological samples.

Module III: ***Forensic Genetics in Wildlife:*** Principles of forensic genetics and its application to wildlife cases. DNA extraction, amplification, and analysis techniques DNA profiling and individual identification methods. Molecular markers used in wildlife forensics. Wildlife population genetics and its role in conservation efforts. Key agencies contributing in wildlife crime enforcement.

Module IV: ***Forensic Pathology and Necropsy Procedures:*** Introduction to wildlife forensic

pathology, forensic toxicology, forensic entomology and its applications in wildlife cases. Necropsy techniques and protocols for wildlife examinations. Identification of causes of death, injuries, and trauma. Identification and analysis of toxic substances in wildlife samples. Effects of toxins on wildlife health.

Practicals:-

1. Use of different techniques in identification of different parts and products of flora and fauna reported in the wildlife trade.
2. Species identification through morphometry: Identification of feathers, fur, scales, and bones
3. Collection, preservation and transport of samples
4. Techniques in preservation and despatch of morbid specimens in vetero-legal cases
5. Immunological method – AGID, ELISA
6. DNA extraction, amplification and sequencing: DNA profiling and individual identification methods
7. Identification of causes of death, injuries, and trauma in wildlife.

References:-

1. Butler, J.M., 2011. Advanced topics in forensic DNA typing: methodology. Academic press.
2. Huffman, Jane E., and John R. Wallace. 2012, Wildlife forensics: methods and applications. John Wiley & Sons,
3. Cooper, J.E. and Cooper, M.E., 2013. Wildlife forensic investigation: principles and practice. CRC press.
4. Linacre, A. ed., 2009. Forensic science in wildlife investigations. CRC press.
5. Dash, H.R., Shrivastava, P., Mohapatra, B.K. and Das, S. eds., 2018. DNA fingerprinting: Advancements and future endeavors. Springer.

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MSFOR04E02 - ECOLOGICAL INFORMATICS

Hours per week: 3+2 **Credit: 4**

Course Outcomes:

- Develop analytical, decision making, and data modelling skills
- Impart computational and informatics skills
- Understand application of various AI techniques to real world problems from an environmental perspective
- Develop spatial data manipulation and handling skills

Module I: ***Ecological Data Analytics & Modelling:*** Identifying key terms of ecological data - Data Preprocessing. Basic concept of ecological modelling; Types of ecological modelling - Deterministic, Stochastic, Theoretical model, Simulation model, Dynamic model, Structural dynamic model and Static model; Concepts of Equilibrium point, Limit cycle, Period doubling, Chaos, Persistence, Hopf bifurcation and different aspects of Stability of the system such as Local stability, Global stability and Asymptotic stability; example case study of theoretical model.

Module II: ***Machine Learning :*** The Machine Learning Processes; Python libraries for Machine Learning. Major machine learning techniques - Making data ready for Machine learning. Supervised v/s Unsupervised learning. Regression: Simple linear, multiple linear and non-linear regression; Classification: K Nearest Neighbors, Decision Trees, Support Vector Machines; Clustering: K Mean Clustering, Hierarchical Clustering, DBSCAN Clustering.

Module III: ***Environmental Data and Information Management :*** Biodiversity Data completeness Analysis: Primary Biodiversity Occurrence data, data aggregation, basic aspects of biodiversity data, spatial, temporal and taxonomic explorations, assessing completeness Building Biodiversity Knowledge Graphs. Applications of AI in Biodiversity and Ecology: Intro to Artificial Intelligence and allied fields, basic terminology, Applications of AI, Case studies

Module IV : ***Remote Sensing and Geographic Information System:*** Principles of Remote Sensing-applications of Remote Sensing in ecological studies. Spatial Data Analysis: Vector data analysis, Raster data analysis - Modelling of spatial Phenomena, spatial interpolation: deterministic and stochastic models, global and local models, regression model, Inverse Distance

Weighted (IDW), Triangulated Irregular Network (TIN), splines, geostatistical approach: kriging, semivariograms.

Practicals:-

1. Data loading from different formats- Data pre-processing techniques- Data visualization
2. Machine learning model creation: Theoretical dynamic Model of continuous population
3. Introduction to Image processing software and RS data collection
4. Understanding band combinations and image visualizations
5. From spectra to indices: Estimation of various indices: Image Classification
6. Working with Google Earth Engine
7. Georeferencing and Digitization

References:-

1. Fundamentals of Ecological Modelling, Jørgensen & Fath,, 2011
2. Modeling Biological Systems: Principles and Applications, Haefner, 2005
3. Machine Learning using Python, Wei-Meng Lee, Wiley, 2019.
4. Introduction to meta-analysis. John Wiley & Sons, Chichester, Borenstein, M., Hedges. L. V., Higgins, J. P. T. and Rothstein, H. R. (2009).
5. Artificial Intelligence, Elaine Rich, Kevin Knight and Shivashankar B Nair, Tata McGraw Hill, 2009.
6. Introduction to Artificial Intelligence and Expert Systems, Dan W. Patterson, Pearson Education, 1990.
7. Introduction to Remote Sensing, J B Campbell and R H Wynne,The Guildford Press, 2011.
8. Remote sensing and Image Interpretation, T.M. Lillesand and R.W. Kiefer, Wiley Publications, 2003
9. Principles of Geographical Information Systems for Land Resources Assessment, P.A. Burrough, Oxford University, 1986.
10. Principles of Geographical Information Systems,O Huisman and Rolf A. de By, ITC, The Netherlands, 2001.

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MSFOR04E03 - INVERTEBRATE ECOLOGY

Hours per week: 3+2 **Credit: 4**

Course Outcomes:

- Understand the evolution and diversification of invertebrates
- Understand the role of invertebrates in ecosystem stability and functioning
- Develop skills for the field sampling techniques for studying invertebrates
- Critically analyse research gaps and challenges for invertebrate conservation

Module I: Evolution and Diversification of Invertebrates: Invertebrates- Definition, classification and evolutionary history. Major invertebrate phyla and their characteristics- Arthropoda, Mollusca, Annelida, Cnidaria, Echinodermata and Porifera- Sensory structures, Defensive mechanisms, Reproduction and development, Adaptations and survival strategies: Defensive mechanisms, mimicry, and camouflage.

Module II: Role of Invertebrates in Ecosystem Stability and Functioning: The ecological importance of invertebrates in various ecosystems- as Keystone species, Pollinators, Seed dispersers and Indicator species. Trophic relationships and ecological dynamics- Predation, herbivory, and parasitism. Trophic Cascades and Food Webs. Nutrient cycling: Decomposers and detritivores.

Module III Field sampling techniques of invertebrates: Importance of field studies in invertebrate research- Ethical considerations and safety guidelines- Essential Field Equipment and Tools- Field surveys and assessment methods- Invertebrate Collection Techniques- Active and Passive Collection Methods- Handling and Ethical Treatment of Specimens-Preservation Techniques.

Module IV Conservation of Invertebrates

Threats to invertebrate biodiversity: Habitat loss, pollution, and climate change- Case studies of endangered and vulnerable invertebrate species- Conservation strategies and initiatives- In-situ-Ex Situ Conservation and Captive Breeding. Future Prospects and Research in Invertebrate Biology

Practicals:-

1. Study on morphology and anatomy of major invertebrate phyla
2. Collection and preservation of representative members of major invertebrate phyla
3. Field sampling and survey techniques of invertebrates
4. Visit to various In-situ- Ex Situ Conservation and Captive Breeding sites of invertebrates

References:-

1. Brusca, R.C., Moore, W. & Shuster, S.M. 2016. Invertebrates. Sinauer Associates, Inc.
2. Collins, N.M. 1988. The Conservation of Insects and their Habitats. Academic Press.
3. Drummond, F.A., and Stubbs, C.S. 2003. Sampling Techniques for Forest Lepidoptera: Caterpillars and Adults. Forest Health Technology Enterprise Team, USDA Forest Service.
4. Hickman, C.P., et al. 2018. "Integrated Principles of Zoology." McGraw-Hill Education.
5. Module II: Role of Invertebrates in Ecosystem Stability and Functioning
6. New, T.R. 2005. Invertebrate Conservation and Agricultural Ecosystems." Cambridge University Press.
7. Pechenik, J.A. 2014. Biology of the Invertebrates. McGraw-Hill Education.
8. Polis, G.A. & Winemiller, K.O. 1996. Food Webs: Integration of Patterns & Dynamics. Chapman and Hall.
9. Ruppert, E.E., Fox, R.S., and Barnes, R.D. 2003. Invertebrate Zoology. Cengage Learning.
10. Samways, M.J. 1994. Insect Conservation Biology. Springer.
11. Thomas, J.A., and Settele, J. 2010. Butterflies in a Changing World: Ecology and Conservation. Springer.

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MSFOR04E04 - WETLAND ECOLOGY

Hours per week: 3+2 **Credit: 4**

Course Outcomes:

- Understand the definition, classification, and importance of wetlands.
- Describe the physical, hydrological and ecological characteristics of wetland ecosystems.
- Analyze the biogeochemical processes and nutrient cycling in wetland environments.
- Evaluate the impacts of human activities on wetland ecosystems and propose conservation strategies.

Module I: Wetland formation and hydrology: Wetlands- Definition-classification – distribution- functions and services. Geological processes shaping wetland landscapes. Wetland hydrology and water regimes. Wetland types based on hydrological characteristics. Nutrient cycling in wetland ecosystems.

Module II: Wetland biodiversity: Vegetation zonation and communities in wetlands. Floral diversity and wetland plant adaptations. Mangroves – diversity, ecological, and protective roles. Wetland faunal diversity - Migratory birds and waterfowl, herpetofauna, odonates, and other aquatic invertebrates.

Module III: Wetland Ecosystem Services: Wetland functions and values -physical, biological, cultural, recreational and economic values. Nutrient cycling in wetlands. Carbon storage and sequestration. Role of wetlands in water purification. Flood control and stormwater management.

Module IV: Wetland Conservation and Management - Threats to wetlands. Conservation issues of Indian wetlands. Sustainable tourism practices in wetlands. Wetland restoration and conservation strategies. Legal and policy frameworks for wetland protection. Global initiatives for conservation of wetland. Ramsar convention - Criteria for Identification of Ramsar site. The Montreux Record and Wetlands of International Importance.

Practical

1. Visit various wetlands and study the vegetation types and faunal diversity.

2. Wetland Hydrological Assessment and workout the Water Quality Index.
3. Study the floral diversity and zonation of a mangrove ecosystem
4. Monitoring the flow rate of water entering and leaving wetland systems
5. Prepare an ecotourism plan for a wetland area.
6. Prepare a restoration plan for a degraded wetland ecosystem

References

1. Babu, C.R., Priyadershini, M. R. B. and Ramesh, B.R. 2019. *Wetland Ecosystems of India: A Guide to Conservation, Restoration, and Management*. Oxford University Press India.
2. Ganapati, T. and Ramachandran, S. 2009. *Wetland Ecology and Management: Case Studies from South Asia.* Springer
3. Ganapati, T., Ramachandran, S. and Anuradha, R. 2012. *Wetland Conservation and Management: Case Studies from South Asia.* Springer.
4. John A. Kadlec and R. John Richardson, 2009. *Wetland Ecology: Principles and Applications*. CRC Press
5. Julie B. Zimmerman, Kent W. Thornton, and Michael R. Penn. 2015. *Wetland Plants: Biology and Ecology*.
6. Krishna, K.R. and Santhosh, A.V. 2014. *Wetlands: Environmental Gradients, Boundaries and Buffers*. Daya Publishing House
7. Nick Davidson, Franck Poly, and Robert A. Francis (Editors) 2006. *Wetland Ecology and Management: Case Studies*. Springer
8. Paul A. Keddy 2010. *Wetland Ecology: Principles and Conservation*. Cambridge University Press
9. Ralph W. Tiner, 2010. *Wetland Indicators: A Guide to Wetland Formation, Identification, Delineation, Classification, and Mapping.* CRC Press
10. William J. Mitsch and James G. Gosselink, 2014. *Wetland Ecosystems*. Wiley.

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MSFOR04E05 - RESTORATION ECOLOGY

Hours per week: 3+2 **Credit: 4**

Course Outcomes:

- Develop skills in tackling various ecosystem disturbances
- Understanding about the restoration of degraded ecosystems
- Develop an integrated approach in ecological restoration programmes
- Understand the importance and need of successful restoration programmes

Module I: Introduction to restoration ecology: Definition, Need, and Approaches- Passive and Active restoration, Types of ecological restoration- natural regeneration, revegetation, rehabilitation, partial restoration, and complete restoration. Value of ecosystems- cultural, supporting, provisioning, and regulating values. Ecosystem Functioning – energy flow, nutrient cycling, and trophic interactions. Ecosystem stability- resistance and resilience.

Module II: Ecosystem disturbances: Ecosystem disturbances – Disturbance regime, Factors determining the scale of disturbances- magnitude, frequency, duration, abruptness, and return interval. Intermediate disturbance hypothesis, Disturbances due to fire, habitat fragmentation, forest degradation, erosion, pollution, desertification, mining, dams, pollution, overhunting, sand dune destabilization, and invasive species.

Module III: Restoration of ecosystems: Restoration of degraded ecosystems- Species compatibility, Alternative stable states, Regime shift by disturbances, Assembly rules in restoration, Ecosystem thresholds, Ecosystem filters, Restoration of soil – Phytoremediation methods- phytovolatilization, phytodegradation, phytostimulation, phytostabilization, phytofiltration, and phytoextraction – continuous process and Induced process. Bioremediation: ex-situ methods- biopiling, landfarming, composting, biofilter and in-situ methods- bioventing, biosparging, bioslurping, biostimulation and bioaugmentation. Restoration of aquatic ecosystems- wetlands, lakes and rivers, Restoration of ecosystems by controlling invasive alien species, Restoration of mining and quarry areas, Restoration of sand dunes, Landscape restoration approaches, and Forest restoration.

Module IV: Management of restoration areas- setting goals, planning, action plan, adaptive management, monitoring, aftercare, and final assessment. Integrated restoration efforts- case studies of forest restoration at national and global level, Bon challenge, Decision making in ecological restoration.

Practical

1. Visit the degraded sites and assess the ground conditions
2. Determination of soil and water quality of degraded sites
3. Prepare a restoration plan for a degraded area
4. Prepare an action plan for the management of restored sites

References:-

- Andre F Clewell and James Aronson, 2013. Ecological restoration (2nd edition): Principles, Values and Structure of an Emerging Profession. Island Press, 336p.
- Evelyn A Howell, John A Harrington, and Stephen B Glass, 2011. Introduction to Restoration Ecology. Island Press, 436p.
- Govind prasad, 2012. Restoration and Conservation Ecology, Discovery Publishing Pvt. Ltd, 202 p.
- Greippson, S. 2011. Restoration Ecology, Jones and Bartlett Learning, 408 p.

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MSFOR04E06 - BEHAVIOURAL ECOLOGY

Hours per week: 3+2 **Credit: 4**

Course Outcomes:

- Understand the key concepts and theories in behavioral ecology.
- Describe the evolutionary processes shaping animal behavior.
- Analyze and interpret animal behavior in the context of ecological interactions.
- Apply scientific methods to study animal behavior and conduct field observations.
- Evaluate the adaptive significance of different behavioral strategies

Module I: Introduction to Animal Behaviour: Ethology, Comparative Psychology and Neurobiology. The proximate/ultimate dichotomy in studying animal behaviour. Innate behaviour in animals; kinesis, taxis, reflex and fixed action patterns. Biological Rhythms. Learned behaviour in animals: imprinting, habituation, conditioning, logical reasoning and trial and error learning.

Module II: Evolutionary Basis of Behavior: Natural selection and adaptation. Genetic basis of behavior. Life history strategies and trade-offs. Habitat selection and resource acquisition. Co-evolution: prey-predator and host-parasite coevolution.

Module III: ***Social and reproductive behaviour in animals:*** Social organisation in Vertebrates. Prey/predator relationships and predator avoidance behaviour. Red Queen hypothesis and the evolution of sexual behaviour. Sexual conflict and sexual selection. Territoriality and courtship behaviour. Significance of territories. Parental care and mating systems. Selfishness and altruism: Kin selection, mutualism and reciprocity. Dispersal behaviour. Foraging Behaviour. Optimal foraging theory and other models. Types and functions of animal communication.

Module IV: ***Adaptations in Animals:*** Structural adaptations in animals and its evolutionary significance. Behavioral adaptations in wild animals – aestivation, hibernation, torpor, diapause, migration and group hunting. Ecogeographical rules of adaptations and variation in animals.

Practicals: -

1. Methods of behavioral observation; Instantaneous scan, focal animal, all-occurrence and one-zero sampling,
2. Collection and analysis of behavioural data on some common availability species.
3. Preparation of ethograms. Time-activity budgets and social interaction matrices.
4. Radio-telemetry methods of studying activity patterns.
5. Behavioral observations on wild and captive animals.

References: -

1. Alcock, J. (2005) Animal Behaviour: An Evolutionary Approach (8th edn.). SinauerAssociates, Inc.
2. Krebs. J.R. (1993). An introduction to behavioural ecology. Blackwell Publishing.
3. Davis, N. B., Krebs, J. R. and West, S.A. (2012) An Introduction to Behavioural Ecology (4th edn.). Wiley-Blackwell.
4. Manning, A. and Dawkins, M. S. (1997) An Introduction to Animal Behaviour. Cambridge University Press.
5. Morton E.S. and B. Stutchbury. (2001). Behavioural ecology. Academic Press

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KANNUR UNIVERSITY

MODEL QUESTION PAPERS

FOR

M.Sc. FORESTRY (WILDLIFE MANAGEMENT)

UNDER

CHOICE BASED CREDIT AND SEMESTER SYSTEM
(OBE – Outcome Based Education – system)

With effect from 2023 admission

END SEMESTER EVALUATION

Evaluation in outcome-based education is designed to measure the attainment of specific learning outcomes. It involves aligning assessments with the outcomes. using criterion-referenced assessment methods, providing continuous feedback, and evaluating the effectiveness of the overall educational programme. By focusing on clear outcomes and providing regular feedback, evaluation in outcome-based education supports student learning and helps improve the quality of education. Outcome evaluation goes beyond assessing individual knowledge and comprehension and focuses on the broader application and integration of knowledge, skills, and attitudes. In outcome evaluation, learners arc expected to demonstrate their ability to critically analyze and evaluate the overall impact and effectiveness of what they have learned or the programme they have participated in.

The end semester examination is based on Bloom's taxonomy criteria (1956), both in the case of theory and practical given as follows;

COGNITIVE LEVEL: BLOOM'S TAXONOMY OF EDUCATIONAL OBJECTIVES

The cognitive domain of learning involves mental operations or thinking skills. There are six major categories in the Cognitive Domain of Bloom's Taxonomy (1956). The levels and the verbs used for stating specific behavioral learning outcomes are listed below.

KNOWLEDGE (Remembering) Recall terms, facts, and details without necessarily understanding the concept	COMPREHENSION (Understanding) Summarize and describe main ideas in own words without necessarily relating it to anything	APPLICATION (Transferring) Apply or transfer learning to own life or to a context different than one in which it was learned	ANALYSIS (Relating) Breaking material into parts, describe patterns and relationships among parts	SYNTHESIS (Creating) Creating something new by combining parts to form a unique solution to a problem	EVALUATION (Judging) Express own opinion, judge or value based on expressed criteria, ideas, methods, . .
Count	Associate	Apply	Analyze	Adapt	Accept
Define	Classify	Build	Categorize	Assemble	Appraise
Draw	Convert	Calculate	Compose	Combine	Assess
Identify	Describe	Classify	Debate	Compare	Compare/Contrast
Label	Differentiate	Compare	Detect	Compose	Critique
List	Discuss	Complete	Diagram	Create	Determine
Locate	Distinguish	Contrast	Differentiate	Design	Evaluate
Name	Estimate	Construct	Distinguish	Formulate	Facilitate
Outline	Explain	Demonstrate	Group	Generalize	Grade
Point	Interpret	Illustrate	Infer	Integrate	Judge
Quote	Match	Modify	Investigate	Invent	Justify
Recite	Paraphrase	Operate	Prioritize	Organize	Measure
Record	Predict	Practice	Relate	Plan	Rank
Repeat	Recognize	Relate	Research	Prepare	Recommend
Select	Select	Report	Separate	Prescribe	Reject
State	Summarize	Solve	Sort	Revise	Select
Write	Translate	Use	Transform	Specify	Test
What is the definition of... Can you recite... When ... Where... Who was... How many...	In your own words, explain... What steps are required... Describe the kinds of...	Give an example that has effected you... If alive today, what do you think he would do about...	What factors distinguish... In what ways... How would life be different if...	How can you put these ideas into action... Predict... When these concepts are linked I see...	In your opinion, ... Choose between ... and defend your answer...
PART A		**PART C**		**PART B**	

QUESTION PAPER PATTERN

Part	Cognitive level	No. of Questions	No. of Questions to be answered	Mark for each question	Total
A	Remembering, Understanding	6	5	3	15
B	Creative, Judging	5	3	6	18
C	Application, Analysis	5	3	9	27
TOTAL MARKS					**60**

KANNUR UNIVERSITY

MODEL QUESTION PAPER

I semester MSc. Forestry (Wildlife Management) Degree Examination

MSFOR01C01- Forests and Biogeography

Time: 3Hrs **Maximum Marks: 60**

Part A – ***Answer any FIVE questions. Each question carries 3 marks*** **(5 X 3 = 15)**

1. Define forestry. List the branches of forestry.
2. Classification of forests based on growing stock
3. Differentiate temperate and tropical forests
4. Characteristic features of fresh water swamp forests
5. Define biome and list the major biomes of the world
6. What is the significance of the Western Ghats in terms of geography and biodiversity?

Part B- ***Answer any THREE questions. Each question carries 6 marks*** **(3 x 6=18)**

7. Critically analyze the state of India's forests during the last decade
8. Compare the pre-independence and post-independence scenarios of Indian forestry
9. India needs to focus on expanding the tree cover outside forests – justify.
10. Prioritize the action to be taken for the conservation of forests in India
11. How can you differentiate a shola forest from other evergreen forests?

Part C- ***Answer any THREE questions. Each question carries 9 marks*** **(3 x 9=27)**

12. How the Satpura Hypothesis contributed to our understanding of the distribution of flora and fauna in Indian subcontinent?
13. Explain the concept of continental drift and how it relates to the formation of mountain ranges like the Western Ghats?
14. Discuss the impact of deforestation on regional and global climate patterns. What strategies can be implemented to mitigate these effects?
15. Following the Champion and Seth Classification of Forest types in India, describe the forest types seen in the Kerala part of Western Ghats.
16. Give a detailed account on the biogeographic zones of India with a neat diagram.

KANNUR UNIVERSITY

MODEL QUESTION PAPER

I semester MSc. Forestry (Wildlife Management) Degree Examination

MSFOR01C02- Dendrology and Vegetation Analysis

Time: 3Hrs **Maximum Marks: 60**

Part A – ***Answer any FIVE questions. Each question carries 3 marks*** **(5 X 3 = 15)**

1. Explain the key principles and outlines of the Bentham and Hooker system of plant classification. Mention some of its merits and demerits.
2. Describe the different versions of molecular systematics classification, including APG I to APG IV.
3. Define DNA barcoding and provide an overview of its significance in the field of taxonomy and species identification.
4. What is the Polymerase Chain Reaction (PCR), and how is it used in the acquisition and analysis of DNA sequence data for phylogenetic analysis?
5. Explain the systematic position, diagnostic features, and economic importance of the following families: - Dipterocarpaceae, Myrtaceae and Apocynaceae
6. Discuss the methods used for the structural analysis of communities, including species-area curves, transects, and quadrates.

Part B- ***Answer any THREE questions. Each question carries 6 marks*** **(3 x 6=18)**

7. Imagine you are a taxonomist tasked with classifying a newly discovered plant species. Describe the creative process you would follow to determine its systematic position and characteristics.
8. Analyze the role of remote sensing in vegetation analysis and land use-land cover mapping.
9. Critically evaluate the concept of forest carbon sequestration and its importance in mitigating climate change.
10. Suppose you are in charge of a wildlife conservation project in a forest ecosystem. Propose a creative plan for maintaining biodiversity while ensuring sustainable resource use.
11. Judge the significance of diversity indices, including Simpson's Index, Shannon-Weiner Index, and Berger Parker Dominance Index, in assessing ecological communities. Compare and contrast their applications.

Part C- ***Answer any THREE questions. Each question carries 9 marks*** **(3 x 9=27)**

12. Apply your knowledge of forest biomass estimation to explain the concepts of above-ground biomass, below-ground biomass, and carbon content of biomass.

13. Analyze the concept of emission trading as a mechanism for carbon management in forests. Discuss its potential benefits and challenges in the context of sustainability.
14. Given a set of forest inventory data, calculate the Classification of Increment (CI), Current Annual Increment (CAI), and Mean Annual Increment (MAI). Explain how these metrics can inform forest management decisions.
15. Apply your understanding of the concept of growing stock enumeration to describe its objectives and different kinds of enumeration methods. Discuss the importance of accurate growing stock data for sustainable forestry.
16. You are tasked with conducting a remote sensing-based land cover mapping project in a forested area. Outline the step-by-step process you would follow, including data acquisition, analysis, and interpretation.

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MODEL QUESTION PAPER

I semester MSc. Forestry (Wildlife Management) Degree Examination

MSFOR01C03- Forest Ecology

Time: 3Hrs **Maximum Marks: 60**

Part A – *Answer any FIVE questions. Each question carries 3 marks* **(5 X 3 = 15)**

1. Explain various stages of succession
2. Outline the characters of Southern Tropical Wet evergreen forests
3. Discuss the models in succession
4. Describe the qualitative characters used in the assessment of vegetation
5. Define population? What are the factors affecting population size?
6. What are the characteristics of a forest community

Part B- *Answer any THREE questions. Each question carries 6 marks* **(3 x 6=18)**

7. What trophic cascade happens when an apex predator from a marine ecosystem becomes extinct?
8. Compare the vegetation characteristics of forest type 4B/TS_2 and 4C/FS_2
9. Prepare an outline for the assessment of vegetation using the Braun-Blanquet method
10. Specify the characteristics, vegetation structure and major species of southern montane wet temperate forests
11. Compare the characteristics of r and k selected species

Part C- *Answer any THREE questions. Each question carries 9 marks* **(3 x 9=27)**

12. Discuss the characteristic features and species composition of the forest type 4C/FS1.
13. Categorize various life forms based on the Raunkiaer system of classification
14. How the forests of Western Ghats were classified according to Meher-Homji classification system.
15. Make a comparison of various theories of succession
16. Analyze the characteristics and species composition of major tropical forest types of Kerala.

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MODEL QUESTION PAPER

I semester MSc. Forestry (Wildlife Management) Degree Examination

MSFOR01C04 – Fundamentals of Wildlife Science

Time: 3Hrs **Maximum Marks: 60**

Part A – ***Answer any FIVE questions. Each question carries 3 marks*** **(5 X 3 = 15)**

1. List the major zoogeographic regions of the world.
2. Describe the characteristics of class mammalia
3. Differentiate Perissodactyla and Artiodactyla
4. Name six mammal species endemic to Western Ghats
5. List the species of primates seen in the Western Ghats
6. Explain the courtship behaviour in birds.

Part B- ***Answer any THREE questions. Each question carries 6 marks*** **(3 x 6=18)**

7. Critically analyze the conservation challenges of herpetofauna of the Indian subcontinent
8. How a bird can keep on in the same direction during its long-distance migratory flight?
9. Compare the characteristic features of reptiles and amphibians.
10. Give a detailed analysis of the threats and conservation challenges of fishes in India.
11. How can you give first aid and manage a snake bite case?

Part C- ***Answer any THREE questions. Each question carries 9 marks*** **(3 x 9=27)**

12. How can you differentiate the species of rodentia from eulipotyphla and lagomorpha
13. What makes the birds anatomically and physiologically adapted for flight.
14. Why do some birds involve in long distance migration? What patterns of migration exhibit by birds?
15. How the vertebrates are classified?
16. What is the significance of clutch size and litter size in animals? Explain the advantages of the reproductive peculiarities of lagomorpha.

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MODEL QUESTION PAPER

I semester MSc. Forestry (Wildlife Management) Degree Examination

MSFOR01C05 – Practical I

(Forests and Biogeography, Dendrology and Vegetation Analysis, Forest Ecology, Fundamentals of Wildlife Science)

Time: 3Hrs **Maximum Marks: 60**

1. Workout and solve the problem **A,** include graphs figures and tables. (Steps, description, figures, graphs and table- 6, Result- 2)	(1 X 8=8)
2. Identify and write the family/order of **B1** to **B10**	(10 X 1= 10)
3. Identify the family and write spot characters **C & D.** (Identification- 1, Note- 2)	(2 X 3= 6)
4. Write the functions of **E** and **F**, and give an example of the bird species. (Identification – 1, Note - 2, Example - 1)	(2 X 4 =8)
5. Construct the CAI and MAI curves from **G** and mark the rotation age.	(1 X 5=5)
6. Write the methodology for **H.**	(1 X 5=5)
7. Solve problem **I**, draw the histogram, and compare with Raunkiaer's standard frequency diagram.	(1 X 7=7)
8. Spot identification of **J, K, L, M** and **N**	(5 X 1=5)
9. Viva-voce	6 marks

Key to the Specimen

1. **A** - IVI
2. **B1** to **B10**– Birds/Mammals/Reptiles and Amphibians.
3. **C, D** – Plant specimen of the family given in the syllabus
4. **E,F** - Beak/leg/feather/nest types in birds
5. **G** – Tabular data for CAI and MAI
6. **H** – field methods of vegetation analysis
7. **I** – Field data for frequency distribution
8. **J, K, L, M, N** – Any specimens related to the topics for practical I

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MODEL QUESTION PAPER

II Semester MSc Forestry (Wildlife Management) Degree Examination

MSFOR02C06 - Nursery Techniques and Plantation Forestry

Time: 3Hrs **Maximum Mark: 60**

Part A - *Answer any FIVE questions*. Each question carries 3 marks **(5 x 3 = 15)**

1. Define the importance of seeds in nursery establishment and outline the key factors to consider when planning seed collection.
2. Describe the methods used for seed collection, fruit and seed handling, and seed processing for nursery sowing.
3. Explain the concept of seed storage and its purpose in seed technology. Discuss the factors that influence seed storage conditions.
4. What is seed dressing and pelleting? Provide examples of when and why these techniques are used in seed technology.
5. Define seed testing and explain the ISTA rules governing it. How is germination testing conducted in a nursery setting?
6. Discuss emerging trends in tropical seed technology and their potential impact on nursery establishment and plantation forestry.

Part B - *Answer any THREE questions*. Each question carries 6 marks **(6 x 3 = 18)**

7. Describe the process for planning the establishment of a nursery for a specific plantation species.
8. Analyze the advantages and disadvantages of containerized nursery techniques.
9. Evaluate the role of plantation forestry in climate change mitigation. What are the ecological factors that influence long-term productivity in plantations?
10. Judge the importance of mixed plantations and continuous cover forests in modern forestry practices. How do these concepts contribute to biodiversity conservation and sustainable yield?
11. Propose a strategy for integrated pest management (IPM) and integrated nutrient management (INM) in a plantation setting.

Part C - *Answer any THREE questions*. Each question carries 9 marks **(9 x 3 = 27)**

12. Apply your knowledge of seed technology to plan the collection and processing of seeds. Describe the steps involved in seed collection, handling, processing, and storage.
13. Analyze the factors that influence the choice of species and land suitability for plantation forestry.
14. Describe sanitation and control measures for effective pest and disease management.
15. Apply your understanding of plantation pests and diseases to identify major pests and diseases in a plantation of a chosen species.

16. Develop a detailed plan for establishing an industrial plantation of a high-value timber species, including species selection, site preparation, and sustainable management practices.

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MODEL QUESTION PAPER

II semester MSc. Forestry (Wildlife Management) Degree Examination

MSFOR02C07- Forest Biometry

Time: 3Hrs **Maximum Marks: 60**

Part A – *Answer any FIVE questions. Each question carries 3 marks* **(5 X 3 = 15)**

1. Name the instruments used for girth and diameter measurements
2. Explain the quarter girth formula
3. Define (a) Form quotient (b) Form height (c) Form class
4. What are the uses of stand table
5. List out non-sampling errors in horizontal sampling
6. Discuss Metzger's theory

Part B- *Answer any THREE questions. Each question carries 6 marks* **(3 x 6=18)**

7. Write in detail about the preparation of the general volume table
8. Specify the standard rules governing breast height measurements
9. How can we determine the volume of logs
10. Write the method of determining the past growth of stands
11. Write the method of determining the future growth of stands

Part C- *Answer any THREE questions. Each question carries 9 marks* **(3 x 9=27)**

12. What are the various categories of sampling, and compare the different sampling units?
13. Illustrate with a diagram how to measure the mean height of the stand using vertical sampling.
14. What are the different categories of yield table? Explain the method of preparation of the yield table
15. Write the classification of volume tables. Explain the method of preparation of the local volume table
16. Illustrate with a diagram how to measure the height of trees using geometric principles method

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MODEL QUESTION PAPER

II semester MSc. Forestry (Wildlife Management) Degree Examination

MSFOR02C08 – Conservation Biology and Captive Wildlife Management

Time: 3Hrs **Maximum Marks: 60**

Part A – ***Answer any FIVE questions. Each question carries 3 marks*** **(5 X 3 = 15)**

1. Define conservation biology. What are the principles of conservation biology?
2. Levels of biodiversity
3. Differentiate National Parks and Wildlife Sanctuaries
4. What is 50/500 rule for maintaining genetic diversity?
5. List the major conservation projects and initiated year in India
6. List the IUCN redlist categories

Part B- ***Answer any THREE questions. Each question carries 6 marks*** **(3 x 6=18)**

7. India is a mega biodiversity nation – justify.
8. Applications of phylogenetics in conservation biology.
9. How the inbreeding leads to a reduction in the genetic quality of a population.
10. In what situations we can recommend the in-situ and ex-situ conservation actions?
11. How the Extent of Occurrence and Area of Occupancy of a species determine its survival?

Part C- ***Answer any THREE questions. Each question carries 9 marks*** **(3 x 9=27)**

12. Explain in detail the success stories of any two conservation breeding programmes
13. Analyze the role of scientific institution and NGOs in Conservation Breeding Programmes
14. How can we safely handle and translocate a problematic animal?
15. The procedure of carrying out redlist assessment. Which are the IUCN criteria?
16. History and development of tiger conservation in India.

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MODEL QUESTION PAPER

II Semester MSc Forestry (Wildlife Management) Degree Examination

MSFOR02C09 - Research Methodology and Biostatistics

Time: 3Hrs Maximum Mark: 60

Part A - *Answer any FIVE questions*. Each question carries 3 marks (5 x 3 = 15)

1. Explain the organized method of investigation and the importance of effectively communicating problem, data, method, and results in research.
2. Differentiate between theoretical, empirical, and experimental research. Provide examples of each type of research.
3. Discuss the two primary modes of inquiry, the hypothetico-deductive and empirical-inductive modes.
4. Describe the components of research documentation, including the elements typically found in a research paper or thesis.
5. Explain the significance of research ethics and how to prevent plagiarism in academic research.
6. Define and elaborate on the terms "research topic," "problem," "questions," "objectives," and "scope."

Part B - *Answer any THREE questions*. Each question carries 6 marks (6 x 3 = 18)

7. Imagine you are starting a new research project in forestry. Describe the creative process you would follow to identify a research problem, develop research questions, and determine the scope of your study.
8. Analyze the elements of a well-structured research paper or thesis, with a focus on the importance of literature review, graphical and tabular presentation, and the scope for future work.
9. Evaluate the applications of different types of probability distributions (Binomial, Poisson, and Normal) in forestry research. Provide examples of situations where each distribution is relevant.
10. Judge the effectiveness of various correlation and regression methods in analyzing forestry data.
11. Propose a research study in forestry where you would apply tests of significance (t, F, z, and $\chi 2$), and ANOVA. Explain the research question, the choice of tests, and the expected outcomes.

Part C - *Answer any THREE questions*. Each question carries 9 marks (9 x 3 = 27)

12. Apply your knowledge of scales of measurement to a forestry scenario, identifying important variables.
13. Analyze a set of forestry data and perform simple and rank correlations as well as linear and nonlinear regressions. Explain how the results can be interpreted in the context of the study.
14. Given a research project, design a suitable experiment using principles of experimental designs (e.g., CRD, RBD, LSD). Justify your choice of design and discuss potential sources of bias.
15. Apply the principles of sampling theory to a forestry study. Design a sampling plan, choosing from different sampling methods, and explain how it ensures representative data collection.
16. Imagine you are conducting research in a forested area. Describe how you would apply cluster sampling to efficiently collect data on tree density and species diversity.

KANNUR UNIVERSITY

MODEL QUESTION PAPER

II semester MSc. Forestry (Wildlife Management) Degree Examination

MSFOR02C10 – Practical II

(Nursery Techniques and Plantation Forestry, Forest Biometry, Conservation Biology and Captive Wildlife Management, Research Methodology and Biostatistics)

Time: 3Hrs **Maximum Marks: 60**

1. Workout and solve the problem **A,** include graphs figures and tables. (Steps, description, figures, graphs and table- 8, Result- 2)	(1 X 10=10)
2. Workout the given problem **B**	(1X5= 5)
3. Workout the given problem **C.**	(1 X 5 =5)
4. Calculate the inbreeding coefficient of "X" from the diagram **D**	(1X 5 =5)
5. Workout the given problem **E**	(1 X 5=5)
6. Workout the given problem **F**	(1 X 5=5)
7. Workout the given problem **G.**	(1 X 5=5)
8. Identify **H** and **I**	(2 X 2=4)
9. Identify **J** and write the aim and procedure	(5 X 1=5)
10. Spot identification of **K, L, M, N** and **O**	(5 X 1=5)
11. Viva-voce	6 marks

Key to the Specimen

1. **A** - One way ANOVA/Two-way ANOVA
2. **B** – Tests of significance – t, F, z, Chi –square test/ Computation of correlations/Layout and analysis of CRD/Layout and analysis of RBD.
3. **C** – Calculation of planting stock/ seed requirement
4. **D** – Pedigree diagram
5. **E** – Calculation of DBH/GBH/Volume of log/Volume of standing trees/tree height
6. **F** – Simpson's / Shannon-weiner diversity index/Jaccards/ morisita-horn similarity index
7. **G** – Problem on population estimation using capture-mark-recapture
8. **H, I** – Track and signs of wild animals/ pugmark reading
9. **J** – Instruments used for topics under forest biometry / field equipment used for wildlife census techniques
10. **K, L, M, N, O** – Any equipment/implements/apparatuses/specimens related to the topics for practical I